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ELECTRIC POWER IN ASIA AND THE FAR EAST 1961 and 1962

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FOREWORD

The present publication is a continuation of the series being issued by the secretariat of the Economic Commission for Asia and the Far East on the subject of public electricity supply in the countries of the region. The secretariat has, since 1951, been publishing statistical data on the public electricity supply in mimeographed form on an annual basis under the title, "Electric Power Bulletin". The data contained in these annual bulletins were collected together every five years and quinquennial issues under the titles, *Electric Power in Asia and the Far East, 1951-1955* and *"1956-1960"* were published under the present series. The present publication contains similar data for the years 1961 and 1962. It is proposed to continue this series on an annual basis in future.

This issue, like the earlier ones, relates mainly to public electricity supply in countries of the region. Although the information regarding electric generating plants owned and operated by industries for their own use was not available with respect to all countries, attempts have been made to include such information wherever possible.

For the first time in this series of publications, data have been included concerning Australia, New Zealand and Western Samoa. It will be recalled that Western Samoa was admitted as a new member and that Australia and New Zealand were included in the geographical scope of the ECAFE region by the United Nations Economic and Social Council at its thirty-sixth session in Geneva in June 1963. As a result of the inclusion of data for these countries, certain figures, such as total installed capacity and total generation, for the region appearing in some of the tables may not tally with the corresponding figures shown in the earlier publications of this series. Also, in some cases the figures appearing in earlier issues have been slightly modified in the light of revised or corrected data received from the countries.

The contents of this publication are divided into two parts. Part I contains a brief review of the electricity supply industry in the region and also the progress of electric power development in the various member countries of ECAFE. Changing trends of development and the introduction of modern methods of work in the various countries have been outlined. Part II contains statistical data on the technical and financial aspects of the electricity supply industry in the region.

The statistical year adopted by the countries of the region for the compilation of electricity statistics is not uniform in all cases. Some countries follow the calendar year. Some use the government fiscal year and still others adopt systems according to their own past practices. The question of collecting and compiling regional statistical data on the basis of some uniform statistical year was considered at the ninth session of the Sub-Committee on Electric Power. As the Sub-Committee felt that it would be very difficult for the organizations in member countries to work out the statistical data on a basis different from what they had been using for their own purposes, it was agreed not to insist on the submission of data on a uniform basis. While it is true that this might affect the comparability of the data to some extent, there should be no difficulty in obtaining a correct appreciation of the status and trends of development of the electricity supply industry in the various countries.

The information contained in this publication is based on the answers of ECAFE member countries to questionnaires circulated by the secretariat. A list of the electric supply authorities and organizations which compiled the data is indicated for reference at the end. The secretariat also made use of information contained in various government publications and reports.

The ECAFE secretariat desires to express its gratitude to the electric supply authorities and others concerned for their kind co-operation and assistance in furnishing this information.

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EXPLANATORY NOTE

The following symbols have been used:

Three dots (. . .) indicate that data are not available or are not separately reported.

A dash (—) indicates that the amount in question is nil or negligible.

A blank in a table indicates that the item is not applicable.

A minus sign (−) indicates a decrease.

A comma (,) is used to distinguish thousands, millions and billions.

A slash (/) indicates a crop year or financial year: for example, 1961/62.
A slash is used in some tables to indicate a ratio or range in ratings.

A hyphen (-) between dates representing years (1956-1960) signifies the full period involved, including the beginning and end years.

The term "billion" signifies a thousand million.

The following abbreviations have been used:

A.C.	alternating current
cps	cycles per second
D.C.	direct current
H.T.	high tension (high voltage)
kcal	kilocalorie
kg	kilogramme
km	kilometre
kV	kilovolt
kVA	kilovolt-ampere
kW	kilowatt
kWh	kilowatt-hour
MW	megawatt (million watts)
MVA	megavolt-ampere
OH	overhead (transmission or distribution lines)
pph	pounds per hour
psi	pounds per square inch
psig	pounds per square inch gauge
rpm	revolutions per minute
UG	underground (cable)
V	volt

Unless otherwise stated, references to "dollars" indicate United States dollars, and to "tons", metric tons.
Minor discrepancies in totals and percentages are due to rounding.

The following exchange rates are used in the conversion of country currencies into US dollars:

Country	*Currency*	*Exchange rate per US dollar*
Afghanistan	Afghani	42.0 for 1961 44.14 for 1964
Australia	Pound Australia (£A)	0.447
Brunei	Malayan dollar (M$)	3.06
Burma	Kyat (K)	4.76
Cambodia	Riel (Ri)	35.0
Ceylon	Rupee (Rs)	4.76
China (Taiwan)	New Taiwan dollar (NT$)	24.8 before 21 November 1958 36.4 from 21 November 1958 to 30 June 1960 40.03 on and after 1 July 1960
Hong Kong	Hong Kong dollar (HK$)	5.71
India	Rupee (Rs)	4.76
Indonesia	Rupiah (Rp)	45.0
Iran	Rial	75.75
Japan	Yen (¥)	360.0
Korea, Republic of	Won (10 Hwan)	130.0
Laos	Kip (Kp)	80.0
Malaysia:		
Former Federation of Malaya	Malayan dollar (M$)	3.06
North Borneo (Sabah)	,, ,, ,,	3.06
Sarawak	,, ,, ,,	3.06
Singapore	,, ,, ,,	3.06
Nepal	Rupee (Rs)	7.15 for 1956 to 1959 7.60 for 1960 to 1962
New Zealand	Pound New Zealand (£ N.Z.)	0.36
Pakistan	Rupee (Rs)	4.76
Philippines	Peso (₱)	2 from 1956 to 1961 3.91 for 1962
Thailand	Baht (Tc)	21.0 for 1960 20.95 for 1961 20.77 for 1962
Viet-Nam, Republic of	Piastre (Pr)	35.0
Western Samoa	Pound New Zealand (£ N.Z.)	0.36

Unless otherwise stated, the term "ECAFE region" or "the region" generally covers Afghanistan, Australia, Brunei, Burma, Cambodia, Ceylon, China (Taiwan), Hong Kong, India, Indonesia, Iran, Japan, Republic of Korea, Laos, Malaysia (Former Federation of Malaya, North Borneo (Sabah), Sarawak and Singapore), Mongolia, Nepal, New Zealand, Pakistan, Philippines, Thailand, Republic of Viet-Nam and Western Samoa.

Data for mainland China are not included.

This document deals largely with data gathered prior to the formation of Malaysia on 16 September 1963. Therefore, the Federation of Malaya, North Borneo (Sabah), Sarawak and Singapore are dealt with separately. However, as the review also covers recent months, they are listed under the main heading—Malaysia.

Unless otherwise stated, data refer only to public electric utilities.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of the frontiers of any country or territory.

Part I

REVIEW OF DEVELOPMENT IN THE PUBLIC ELECTRICITY SUPPLY INDUSTRY IN THE ECAFE REGION 1961 AND 1962

A. STATUS OF ELECTRIC POWER DEVELOPMENT IN THE ECAFE REGION, 1961 — 1962

Trend of development

Steady rates of growth of electric power supplies have been maintained by almost all the countries of the region in recent years. The five attached charts show the rise in the installed generating capacity and the energy generation of the public utility electric power plants in the various countries of the region during the period 1951-1962. During this eleven-year period, the gross electricity generation increased from 66 billion kWh to about 200 billion kWh, representing more than a three-fold increase (see table 1). During the same period, consumption of electrical energy in the world as a whole increased to about 2.52 times, that in the Soviet Union to 3.58 times, that in Europe to 2.33 times and that in the United States to 2.17 times. In other words, the ECAFE countries have maintained a high rate of growth of electricity production exceeded only by the Soviet Union (see table 2).

While this relatively high rate of growth may be a matter of satisfaction, it has to be remembered that, in absolute terms, the position of the ECAFE countries is far behind those of the United States, the Soviet Union and Europe. The total electricity generation in 1962 of all the countries of the ECAFE region amounted to less than 60 per cent of that in the Soviet Union and barely 21 per cent of that in the United States. Since Japan contributed over 62 per cent of the electricity generation in the ECAFE region, the position of the other countries is actually very much lower; and, when this is considered in relation to the large population of this region, it will be clear that the countries of the region have a very long way to go to achieve the level of development in Europe, the Soviet Union and the United States.

The total installed generating capacity of the public utility power plants of the ECAFE countries at the end

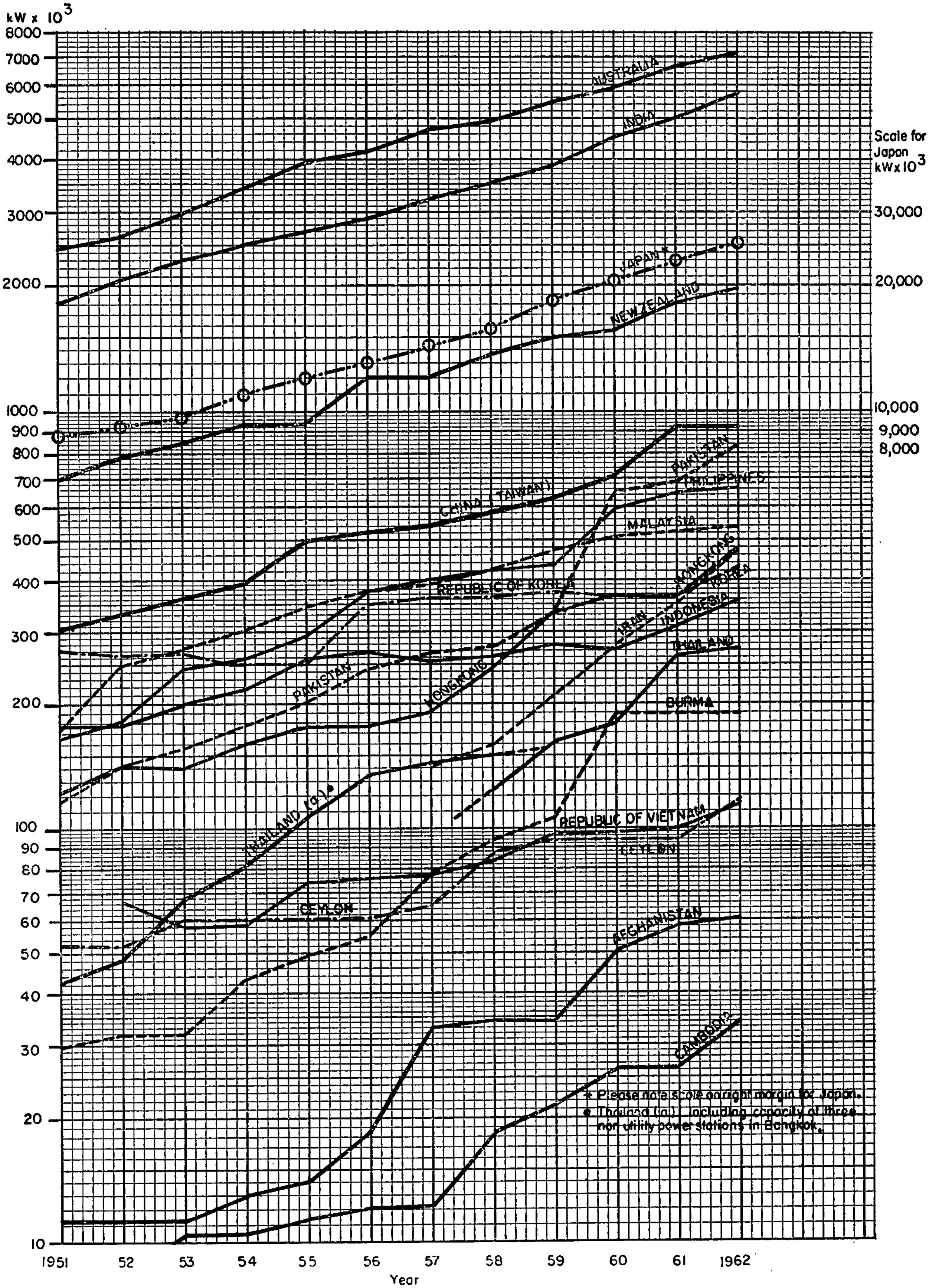
Table 1.

PAST TRENDS IN THE GROWTH OF ELECTRICITY GENERATION IN THE ECAFE REGION

Country	*Energy generation (in million kWh)*					*Average annual percentage increase during*			
	1951	*1956*	*1960*	*1961*	*1962*	*1956/51*	*1961/56*	*1961/60*	*1962/61*
Afghanistan	24.3	35.6	118.0	123.0	160.5	8.2	28.1	4.2	30.5
Australia	10,420.0	16,055.0	22,221.0	23,955.0	25,453.0	9.0	8.2	7.8	6.5
Brunei	0.47	3.4	9.1	10.3	11.1	48.6	24.8	13.2	7.8
Burma	40.9	112.2	254.2	287.3	322.3	22.2	20.2	13.0	12.1
Cambodia	18.9[a]	34.4	61.3	74.2	82.3	12.1	17.2	21.0	10.9
Ceylon	96.2	193.1	288.8	311.1	350.7	15.0	10.1	7.7	13.0
China (Taiwan)	1,285.1	2,249.8	3,628.0	4,083.7	4,692.7	11.9	12.6	12.6	15.0
Hong Kong	415.2	710.0	1,301.5	1,542.4	1,786.9	11.5	16.8	18.5	15.9
India	5,858.0	9,663.7	17,078.7	20,036.9	22,833.8	10.5	15.8	17.2	13.7
Indonesia	614.0	1,480.0	1,050.0	1,220.0	1,242.1	19.2	—	—	2.0
Iran	...	268.3[b]	860.0	940.0	1,000.0	...	28.5	9.3	6.4
Japan	41,434.0	62,500.0	101,700.0	116,809.0	124,019.0	8.3	13.1	14.9	6.2
Korea, Republc of	314.0	1,119.0	1,699.4	1,772.0	1,978.5	28.7	9.7	4.3	11.6
Laso	0.88[c]	2.7	6.9	8.0	9.4	32.4	24.2	16.0	17.5
Malaysia:									
Former Federation of Malaya	618.0	902.1	1,134.3	1,293.7	1,425.5	7.6	7.4	14.2	10.0
North Borneo (Sabah)	...	4.3	15.0	18.7	22.9	...	34.2	24.7	22.5
Sarawak	3.5	9.9	18.9	23.6	27.2	24.1	19.1	24.9	15.9
Singapore	208.6	417.0	610.4	664.4	716.9	14.9	9.8	8.9	8.0
Nepal	6.2	10.3	11.3	10.9	12.6	10.0	1.5	—	16.0
New Zealand	3,462.0	4,967.0	6,835.0	7,399.0	7,951.0	7.5	8.2	8.3	17.5
Pakistan	299.3	838.2	1,449.9	1,818.9	2,307.5	22.9	16.7	25.5	27.2
Philippines	594.0	1,279.9	2,259.5	2,555.3	3,010.1	15.0	12.2	13.1	17.8
Thailand	104.8	328.1	515.7	611.9	709.2	25.6	12.7	18.7	15.9
Viet-Nam, Republic of	216.0	212.5	304.0	328.6	374.9	—	9.1	8.1	14.2
Western Samoa	...	...	4.4	4.9	5.7	...	...	11.3	15.6
Total for ECAFE region	66,034.4	103,396.5	163,435.3	185,903.7	200,505.8	9.4	12.5	13.8	7.9

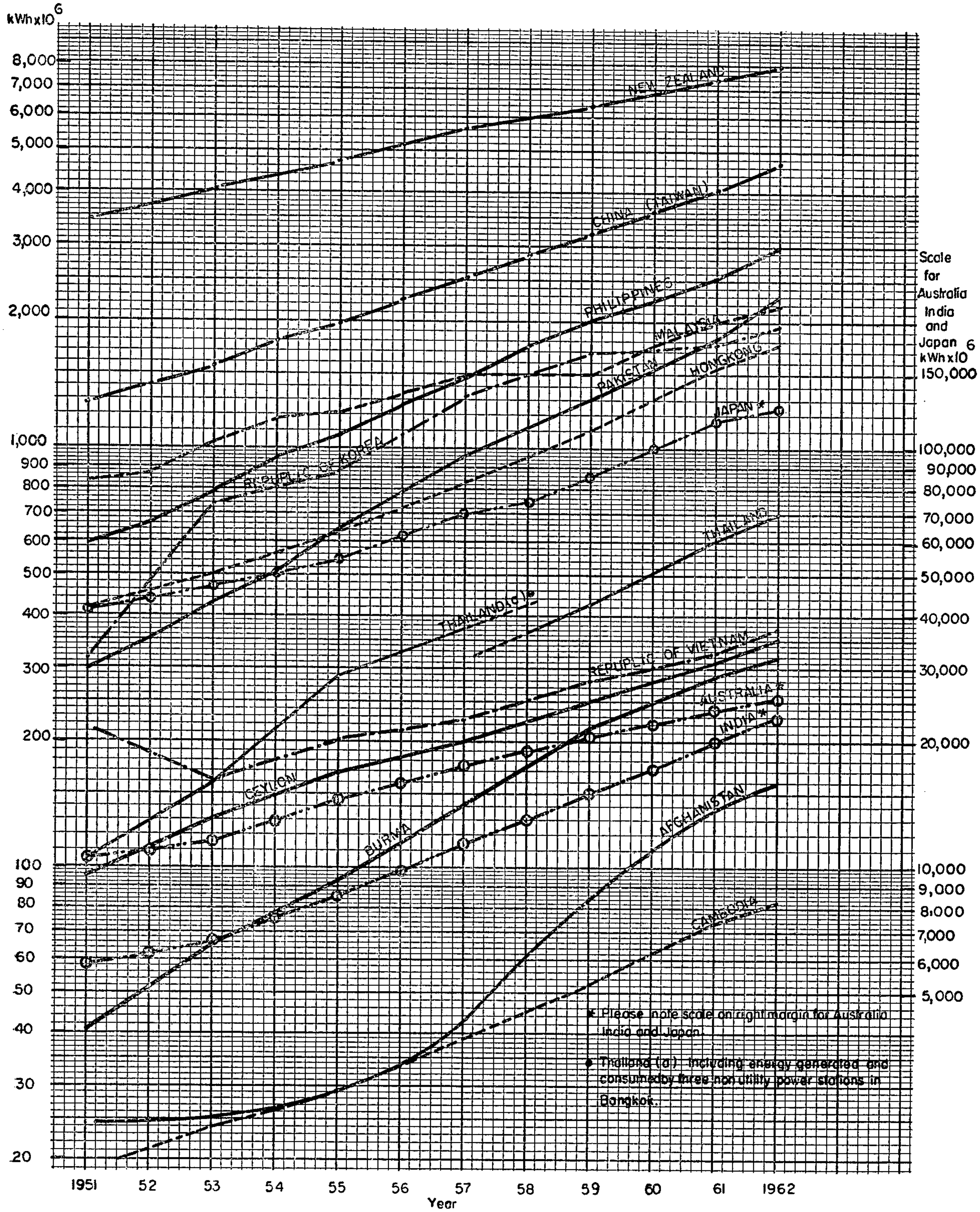
[a] Estimated. [b] For 1957. [c] For 1952.

Chart 1.



INSTALLED GENERATING CAPACITY OF ELECTRIC SUPPLY UTILITIES 1951 TO 1962

Chart 2.



ANNUAL ELECTRICITY GENERATION
BY
PUBLIC SUPPLY UTILITIES 1951 TO 1962

Chart 3.

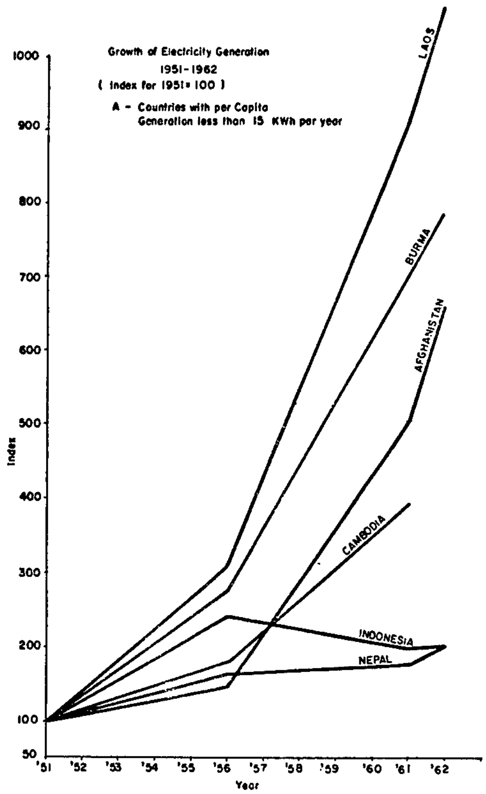


Chart 4.

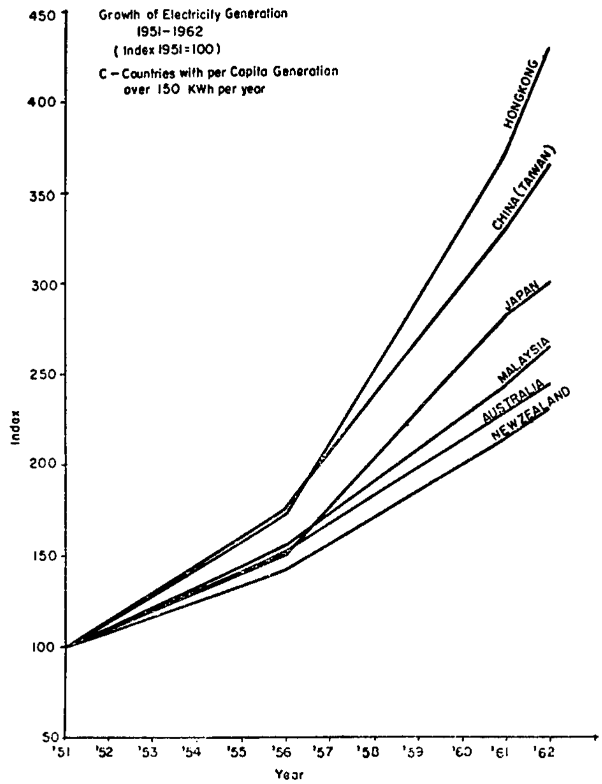


Chart 5.

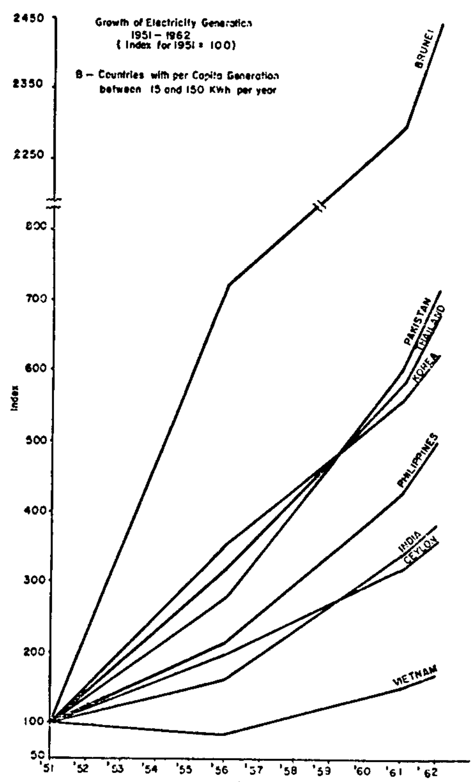


Table 2.

GROWTH OF ELECTRICITY SUPPLIES DURING PERIOD 1951-62 IN SELECTED COUNTRIES AND REGIONS

Region or country	Electricity supplies during 1951	1956 (billion kWh)	1961	1962	Ratio 1962/51	Annual percentage increase during 1956/51	1961/56	1962/61
World	1,077	1,691	2,440	2,710	2.52	9.4	7.6	11.1
Soviet Union	97	180	307	347	3.58	13.2	11.7	13.0
Europe	331	490	712	771	2.33	8.9	8.1	8.3
United States	436	689	881	944	2.17	9.6	5.1	7.15
ECAFE region	66	103	186	200	3.03	9.3	12.6	7.53

of 1951 was 15.44 million kW, which, with a total generation of 66,038 million kWh, yields an average plant utilization period of only 4,280 hours; but, by 1962, the installed generating capacity and the generation had increased to 45.98 million kW and 200.51 billion kWh respectively, thus raising the average plant utilization period to about 4,350 hours. In other words, the rate of growth of the installed capacity has been somewhat lower than that of generation and the installed plants are being used at a higher average load in 1962 than in 1951.

Analysis of the installed generating capacity according to type of prime movers shows that there is an increasing trend towards the installation of thermal power plants, particularly in countries such as Japan and China (Taiwan). This does not mean that the known resources for hydro-electric power development have been fully developed or otherwise exhausted.

In Japan, many of the potential water power sites which could be developed with relative ease have already been harnessed, and the future schemes, the sites for which are largely located upstream on the major rivers in less accessible mountain regions, are generally more expensive and difficult to develop. While steps are being taken to harness all the available economic water power potential, it has been found necessary to undertake, on an urgent basis, the construction of thermal power stations also, in order to meet the continually rising and insistent demands for electric power. Among the more important reasons for the increasing installation of thermal power plants are: (1) thermal power plants require shorter periods for construction and commissioning, which is a very important factor in meeting the ever-increasing demands for power; (2) the initial capital outlay per kW of thermal plant is less than that for hydro plants; (3) with the recent technological developments in the field of thermal power, thermal plants (particularly those with reasonably large capacities) can be operated at high thermal efficiencies and in many cases it is possible for thermal power plants to be economically competitive with hydro power stations; (4) in view of the seasonal variations in the output of hydro stations, it is necessary to build thermal power plants and operate them on an integrated programme.

The above remarks are equally valid in the case of China (Taiwan), where the thermal power stations at Shen Ao in the north and Nanpu in the south have recently been augmented. A new 125 MW unit was added at the Nanpu station in 1963. Although work on hydro schemes is continuing (Tachia valley schemes etc.), thermal power capacity is also being developed in a substantial measure simultaneously.

Significant growth of thermal power capacity in recent years has also been observed in other countries. The discovery of natural gas at Sui in Baluchistan (Pakistan) has encouraged the construction of several large thermal power stations at Karachi, Multan, etc., apart from various hydro-electric schemes such as the one at Warsak. In India, despite concerted efforts to harness the hydro-electric power potential in the country, thermal power plants have also been commissioned in large capacities. Under the third five-year plan, the proposed ratio between thermal and hydro power plant capacities is 3:2. Similarly, in the Philippines, hydro-electric power has been unable to catch up with the demands and therefore thermal power plants have been and are being added at Manila. The demand for power in Bangkok was so insistent that its satisfaction could not be postponed till the completion and commissioning of the Yanhee hydro-electric station in 1964. A 75 MW thermal power plant was therefore commissioned in Bangkok in March 1961 and this was increased to 150 MW early in 1963. Table 3 below shows the relative growth of hydro and thermal power in selected countries.

Table 3.

RELATIVE GROWTH OF THERMAL AND HYDRO POWER IN SELECTED COUNTRIES

Country	Thermal: Installed capacity (MW)	Thermal: Generation (million kWh)	Hydro: Installed capacity (MW)	Hydro: Generation (million kWh)	Total: Installed capacity (MW)	Total: Generation (million kWh)	Ratio (percentage): (2) to (6)	Ratio (percentage): (3) to (7)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Japan								
1956	4,367.4	15,442.0	8,714.4	47,058.0	13,081.8	62,500.0	33.4	24.7
1962	12,319.0	66,900.0	13,184.0	57,119.0	25,503.0	124,019.0	48.3	54.0
India								
1956	1,824.7	5,367.2	1,061.4	4,294.9	2,886.1	9,662.1	63.2	55.7
1962	2,863.3	10,560.3	2,916.5	11,804.5	5,779.8	22,364.8	49.6	47.2
Pakistan								
1956	181.6	403.3	62.7	417.9	244.3	821.2	80.8	49.1
1962	505.4	1,040.1	333.4	1,267.4	838.8	2,307.5	60.3	45.0
Philippines								
1956	217.2	803.7	159.4	476.2	376.6	1,279.9	57.6	62.7
1962	370.0	1,763.6	291.1	1,246.5	661.1	3,010.1	56.0	58.6
China (Taiwan)								
1956	142.5	592.9	377.9	1,649.6	520.4	2,242.5	27.4	26.3
1962	385.4	2,526.4	538.0	2,157.5	923.4	4,683.9	41.6	54.0

Need for systematic studies on load forecasting

The most common experience of the countries of the region in regard to their electric power development programmes is that the demand for power has always been ahead of the available generating capacity. Despite what the countries feel to be very liberal allocations of resources for electric power development, the supply capacity has almost invariably fallen behind the requirements. In some cases, it may have been due to delays and difficulties in the completion and the commissioning of the authorized projects. But generally speaking, there appears to be an urgent need to make a realistic assessment of the future requirements of power and take effective measures to provide adequate power generating capacity in good time.

The system of semi-annual electric power surveys initiated and pursued by the electric utility industry in Japan is undoubtedly of much help in planning the future development programmes. Load forecasting, to be effective, must be reviewed and continually brought up-to-date, which is precisely what the semi-annual surveys seek to accomplish. These surveys are chiefly concerned with short-term estimates (5 years) of the peak demand by areas and they help to determine the generating capacity necessary to meet the anticipated demand. The surveys also contain information on the production capacity and output of the heavy electrical manufacturing industry. According to the semi-annual survey for October 1962, the anticipated peak load for the whole of Japan in 1967 is 37.1 million kW and the energy requirements 212,758 million kWh. Against these requirements, the probable capacity and energy output based on the projects scheduled for execution will be only 33.43 million kW and 194,658 million kWh respectively. Thus deficits amounting to about 10 per cent are anticipated unless additional projects are undertaken immediately and completed before 1966.

Concurrently with the semi-annual power surveys, Japan is also undertaking long-term studies (20 years) of the over-all energy needs. These studies will provide a proper perspective within which short-term developments can be worked out in such a manner that they can be made to fit properly into a long-range programme. The electrical energy balance studies conducted in Japan show that, compared with the generation of 116,809 million kWh in 1961, the total generation in 1980 will be 430,000 million kWh, for which an installed capacity of approximately 105,310 MW will be necessary (see table 4).

Table 4[a]

ENERGY REQUIREMENTS AND SUPPLY BALANCE AND MAXIMUM INSTALLED CAPACITY REQUIRED

			FY 1959 (Actual)	FY 1970	FY 1980
Supply	Energy (10^6 kWh)	Hydro	61,600	91,900	105,900
		Thermal	34,400	167,900	369,900
		Total	96,000	259,800	475,800
Capability	Capacity (MW)	Hydro	11,408	22,520	30,480
		Thermal	9,762	34,780	74,830
		Total	21,170	57,300	105,310
Energy requirements (10^6 kWh)			84,509	235,000	430,000
Fuel requirements (thousand tons)			16,300	75,100	159,000

[a] *Electric Power Industry in Japan, 1963,* issued by the Overseas Electric Industry Surveys Institute, Inc., p.34.

For the past several years, India has had to put up with power shortages in almost all its regions. A little over 10 per cent of the over-all five-year plan outlay has been earmarked for power development, but experience has clearly shown that this is inadequate. At the time when the third five-year plan was formulated, the target adopted for the installed generating capacity by March 1966 was about 11.8 million kW; this has since been increased to 12.5 million kW. The achievement of this target will be by no means easy; continual difficulties of various kinds — foreign exchange and supply of materials (cement, steel, etc.) in short supply — have to be overcome and effective technical and administrative co-ordination ensured. Meanwhile, the Government of India established two committees — the membership of which includes eminent specialists both from India and abroad — to carry out a comprehensive study of the energy needs and electric power supply.

The first committee was required to prepare an over-all electric power survey. It was to make an assessment of the requirements by various regions and by various categories of consumers of electric power by 1971 and, on the basis of this assessment, to consider measures which should be taken to meet the demands effectively. The role of different types of power plants — hydro-electric, thermal and nuclear — in meeting the total power demand were to be examined. The committee was also to work out an outline plan for regional and all-India grids providing the best economic and integrated utilization of power resources of different types. The committee was to deal with other essential matters such as the financial investments required to carry out the power development programme, supply of plant and equipment both by importation and by the establishment of factories within the country, transportation facilities particularly for bulk commodities such as coal and very large and heavy pieces of equipment, and skilled manpower for the construction, operation and maintenance of power systems. It is expected that this committee will also give consideration to an organizational pattern for power surveys in future; probably arrangements similar to the semi-annual surveys being conducted in the United States and Japan may be introduced.

Apart from considering the technical matters mentioned above, the committee was required to make recommendations to the Government on questions bearing on electricity legislation, organizational matters, and financial and tariff policies. In effect it would appear that the committee was to conduct an over-all review of the electricity supply industry in India and to recommend measures designed to ensure rapid and orderly development of the industry in the future.

The committee issued its first annual report in July 1963, according to which the peak load and the scheduled plant capability of public electric utilities by 1965-66 (the end of the third five-year plan) are expected to reach 8.26 million kW and 10.95 million kW respectively. By 1970-71 the demand is expected to exceed the capability, but additional installations are expected to be taken up under the fourth five-year plan. It is understood that the power survey will be pursued on a continuing basis and periodic publications will be issued on an annual or semi-annual basis.

The second committee appointed by the Government of India is concerned with an over-all energy survey and will cover the present and prospective demands and supplies of energy of all kinds up to 1981. The study is expected to provide the necessary basic material for development planning in the energy field.

In China (Taiwan), where the Taiwan Power Company has accomplished creditable development during recent years, an eleven-man team of utility specialists is studying expansion plans and operating practices. This study will necessarily include a realistic estimate of future requirements of electric power. The annual growth of electricity consumption in China (Taiwan) has been as high as about 17 per cent in recent years.

In the Philippines, the National Power Corporation has been continuously attempting to follow the trends of power demand. Recently, following a case study undertaken by the International Atomic Energy Agency to examine the feasibility of establishing nuclear power plants in the Philippines, it was proposed to make a pre-investment study bearing on all relevant aspects and including a reasonably long-term assessment of the demands for power (up to 1975). This pre-investment survey, which is estimated to involve an expenditure of $458,000 in foreign currency, was recently approved by the United Nations Special Fund. The local counterpart expenditure of ₱1,450,000 will be met by the Philippine Government.

Power market surveys have been carried out in Pakistan with the help of consulting engineers appointed for the purpose. In the context of concerted development efforts and fast changing situations, it is obviously necessary to revise the load data from time to time and keep it up to date. It is understood that the International Engineering Company in East Pakistan and the Harza Engineering Consultants in West Pakistan have been entrusted with the responsibility of carrying out these surveys.

Hydro-electric surveys

In comparison with the probable total hydro-electric power potential of the countries of the region, only a small fraction has been so far harnessed for beneficial use. Hydro-electric power has the advantage that the operating expenses are low owing to absence of fuel and, although the total initial costs may be high (compared with thermal power plants), the size of the foreign exchange component is relatively small. Despite these economic advantages, it has been the experience of many countries of the region that hydro-electric power

development has not been as rapid as desired, which has, incidentally, necessitated the construction of alternative thermal power plants. Among the reasons for the relatively slower rate of progress of hydro-electric schemes, is the lack of essential hydrological data which are necessary to prepare hydro power projects. Normally it is desirable to have long-term data on the rainfall and river flow (at least for 20 years) in order to estimate on a dependable and realistic basis, the probable output at a given site. Basin-wide hydrological surveys should therefore be commenced and all the essential data accumulated so that they may be applied whenever a given hydro-electric power site is taken up for development. It is hardly possible to overemphasize the importance of such hydrological surveys to countries which have not so far undertaken them. The expenditure incurred on such investigations much in advance of the execution of the hydro-electric projects is fully justified.

China (Taiwan) has carried out certain systematic studies and has computed the theoretical hydro-electric power potential in the island on the basis of topographical, rainfall and run-off data. The estimated theoretical potential is approximately 12 million kW or about 336 kW per sq km. Of the 65 streams in the island, only 17 have potentials exceeding 100,000 kW and consequently, these are among the more important. The estimated potential of these 17 rivers above an elevation of 200 metres is 8,822,000 kW. It is reported that river sections below this elevation are not considered suitable for power development because of the flatness of their beds and because diverting their flow would hinder irrigation and so on.

Following these over-all studies, the Taiwan Power Company is concentrating attention on the development of the Tachia river valley. A reservoir above the Tachien gorge will regulate the flow of the Tachia river which will be harnessed at various locations, developing a total potential of 1.3 million kW.

India estimates its total hydro-electric potential at about 40 million kW at 60 per cent load factor. This is based on rainfall records, run-off calculations and topographical maps. When detailed basin-wide hydrological surveys have been completed, it is possible that this figure will be exceeded. The imperative need for adequate preliminary investigations and the preparation of project reports on the basis of reliable and realistic data before hydro-electric projects are undertaken is clearly recognized by the authorities. Under a United Nations Special Fund project, detailed investigations at about 65 prospective hydro-electric power sites are to be undertaken in accordance with the current and the subsequent five-year plans of the Government.

Nepal is ideally suited to hydro-electric power development owing to its high mountains and several large snow-fed rivers, the Karnali, Gandak, Kosi, etc. As a first step towards the beneficial utilization of the vast water resources, Nepal has signed an agreement with the United Nations Special Fund for a comprehensive survey of the Karnali river basin. Under this agreement, the Special Fund is to contribute $914,000 and the Government of Nepal a counterpart contribution in Nepalese rupees to the equivalent of $284,500. This survey will not only bring out clearly the potential hydro-electric power capacity of the Karnali basin, but will also identify sites at which power plants can be established. Among the sites which are considered feasible on the basis of preliminary studies are those at Chisapani (160 MW), Bajora (100 MW) and Ra (200 MW).

It is likely that the enormous hydro power potential of Nepal may not all be absorbed within a short period by that country; hence it may be of mutual benefit to Nepal and neighbouring India to consider the feasibility of entering into an agreement under which India could purchase surplus power from Nepal on a short-term or long-term basis. It is understood that the two countries have recently established a Joint Co-ordination Board chiefly for the exchange of information on river valley schemes of interest to them both. It is expected that this will lead to their further co-operation in the matter of water resources development.

It is reported that Special Fund projects on water resource surveys are in progress in Afghanistan, Pakistan and China (Taiwan). Full details of these projects are not available, but they are understood to include, in addition to power development, various other aspects such as irrigation, navigation, flood control and fisheries.

In Sarawak (Malaysia), the Government of Australia has provided the services of an experienced engineer under the Colombo Plan to advise the authorities on the collection and recording of hydrological data to form the basis for the development of the hydro-electric potential as and when necessary. According to the preliminary results available, the theoretical hydro-electric energy potential of Sarawak will be 192 billion kWh per year. The net economical potential that it will be possible to harness may be much less than this figure; nevertheless, even assuming that only 20 per cent of the potential can be usefully utilized, it will be about 38 billion kWh per year. At the present per capita rate of electricity consumption in the United States (say about 5,000 kWh per year) this would be adequate to meet the needs of over 7 million people, (whereas the population of Sarawak is only about 0.75 million).

Similar investigations on hydro-electric power potential are also being undertaken in North Borneo (Malaysia) with Australian help under the Colombo Plan.

Power generation and transmission

The aggregate installed capacity of the public utility undertakings in the ECAFE region at the end of 1962 was 45,982,400 kW. This represented an increase of 11.6 per cent over the figure for 1961. The corresponding percentage increases during 1961, 1960, 1959 and 1958 were 10.9, 12.6, 20.3 and 8.6 respectively. There is an unmistakable trend for the capacity to be doubled every five or six years.

As already indicated, the distribution of the installed generating capacity is far from uniform. Nearly 55.4 per cent of it is concentrated in Japan, and all the other countries of the region[1] share between themselves an aggregate capacity of 20.48 million kW only. Considering the importance of electric power supply facilities in the economic infrastructure so urgently needed by the countries, these figures show how much more remains to be accomplished in the field of electric power, in spite of the sizeable efforts currently being made by most countries.

Countries of the region have begun to consider seriously planning electric power development not on the basis of small-scale and local supplies, but on a long-range and large-scale basis. In other words, efforts are being made as far as possible to introduce systematic methods of planning so as to ensure co-ordinated and optimum development of the available natural power resources in the over-all public interest. As far as possible, large capacity central power stations with appropriate high voltage transmission or subtransmission lines are being built instead of small and local power stations. In consequence, the capacities of individual power stations as well as of the individual generating units are increasing. This increase in size of generating units is observed particularly in the case of steam power stations. In the case of hydro stations, the unit capacity is determined by various factors pertaining to the site; but even here the increase in the size of the unit is clearly observed.

The economies of size achieved by the adoption of larger units of generating plant have indeed been very considerable in most countries. It is stated that, by doubling the capacity of a generating unit (steam power plant), its unit cost per kW can be reduced by approximately 25 per cent. It will be further agreed that the total over-all operating expenses for one large unit will be less than that for two or more units with the same aggregate capacity. Particularly with thermal (steam) plants, it is possible to adopt higher steam conditions (pressure and temperature) with larger units, which contributes to increased over-all thermal efficiency.

Notwithstanding the advantages of large generating units, the construction of power plants has to be closely co-ordinated with the demand for power. In several countries of the region, there are local areas which are relatively undeveloped and where one has to contend at present with little or poor demand for power. In these areas, special load promotional efforts will have to pursued. It is obvious that in such cases one has to start with small power plants, such as diesel engine-driven generating sets. The diesel sets, though relatively more expensive in over-all cost of generation, are admirably suited for pilot projects, i.e. for building up load demand in virgin areas. Once a reasonable amount of load has been built up in a given area, the feasibility may be examined of extending supply to the centre, say, from an alternative central station and transferring the diesel plant elsewhere.

The highest transmission line voltage in use in the ECAFE region is in Australia—330 kV. Transmission lines at 275 kV have been built and are in operation in Australia and Japan. Burma, India, Japan, Pakistan and the Philippines have lines operating at 220/230 kV. Other transmission voltages in use in the region are 154 kV, 132 kV, 110 kV and 66 kV.

The purpose of a high voltage transmission line is twofold, (1) to transmit power from the centre of generation to the centre of distribution and (2) to interconnect two or more power stations and provide for interchange of power either on a scheduled basis or for emergencies. At present, the role of transmission lines in several countries of the region is chiefly to serve the former purpose, though in China (Taiwan), Japan and some other countries, the transmission lines are used as a means of effecting the integrated operation of the entire power network. With the growing development of the natural power resources in almost all the countries of the region, it is expected that more transmission lines designed to integrate power systems will be built in the future.

High voltage direct current transmission has not yet been brought into operation in the ECAFE region. Following the successful results of the direct current submarine cable between the Swedish mainland and Gotland (1954) and between England and France (1961), New Zealand has on hand a project for interconnecting the north and south islands. The north island has a population twice that of the south island, but the south island has a relatively larger hydro-electric potential. A hydro-electric power station is to be built at Benmore in south island with an installed capacity of 540,000 kW. The power generated will be converted to direct current at 500 kV (mid point earthed) and transmitted over a distance of 570 km (354 miles) to Haywards in north island. This route length will include about 40 km (25 miles) of submarine direct current cable across Cook Strait. The capacity of the direct current line will be 600 MW, but in the event of an emergency such as faults on one of the conductors, the system will be able to transmit 300 MW between one conductor and the ground. This interconnexion is expected to be ready by 1964.

[1] Exclusive of China (mainland).

Japan has an effectively interconnected network comprising transmission systems of all the nine power companies and the Electric Power Development Company. The power systems of the individual companies can assist one another by exchanging power according to the requirements and by maintaining stable conditions of supply. For historical reasons, Japan is handicapped by having two standard frequencies. In the eastern part of the country, the supply frequency is 50 cycles per second, whereas it is 60 cycles per second in the rest of the country. Some years ago, attempts were made to unify the frequencies, but they were later given up as being too expensive and difficult. Nevertheless, various methods of transferring power between 50 cps and 60 cps regions were tried. The generating units, especially those near the border line, have been designed for operation at both frequencies. This procedure has drawbacks arising from increased energy losses and also from the cumbersome switching arrangements. Another method would be to instal rotary frequency converters. Attempts have been made more recently to use mercury arc converters and inverters to effect this interconnexion. At either end, the A.C. supply (50 or 60 cps) can be converted to D.C. or inverted from D.C. to A.C. Thus by the interposition of a D.C. line and terminal converter/inverters, the power systems at different frequencies can be effectively inter-connected. Following the success of the systems of D.C. interconnexion between the Swedish mainland and Gotland and also between the United Kingdom and France, Japan adopted this principle.

Interconnected transmission systems are also in operation in China (Taiwan), India, Pakistan and the Philippines. The entire electric utility industry in China (Taiwan) owned by the Taiwan Power Company has a wholly integrated transmission network comprising a major 154 kV transmission line from north to south and a 66 kV line from east to west. The various individual power plants are operated with a view to ensuring a dependably high quality of supply to the consumer and maximum economy of operation. Most of the state electricity boards in India have built transmission networks to interconnect the power stations in each board's region. Transmission line interconnexions have similarly been established both in East and West Pakistan. In the Philippines, the hydro stations of the National Power Corporation are interconnected with the steam station at Manila. These transmission interconnexions are used to regulate the power output at the individual generating centres according to the power requirements at various load centres and to the generating capacities of the plants. By and large, the transmission lines are not yet being used as tie lines between major systems to transfer large blocks of energy, but with the growth in the size of power systems and the area of power supply, exchange of power in large blocks over transmission tie lines will be found advantageous.

Thanks to the diversity of load demands, an interconnected system requires less over-all generating capacity to meet the total demand and in addition the standby or spare plant capacity can also be reduced. The integrated operation secures for the consumer reliability and security, which were not possible before. Having regard to the varying characteristics of the different types of natural resources—coal, oil, natural gas, nuclear resources and water power, etc., integrated operation enables the optimum development and most effective utilization of these resources. Sources showing pronounced seasonal characteristics would normally not be found attractive were it not for the possibility of interconnected development.

Nearly three to four decades ago, the (then) Central Electricity Board in the United Kingdom initiated the development of an extensive grid system at 132 kV. It is understood that the expenditure on the construction of the transmission line interconnexions amounting to over £40 million (up to 1946) could be set off against the savings effected by reducing the installation of spare and standby plants. It is also estimated that, as a result of reduction of the fuel consumption, an annual saving of £3.25 million has been realized. The 132 kV network was found to be good enough up to a few years ago but, with the increasing demands for power on one side and the increasing unit sizes and capacities of power stations on the other, the need was felt for still higher transmission voltages. A 275 kV network of lines has been added in recent years to help in bulk transfer of power from one centre to another. Even this has been found inadequate and consideration is now being given to the building of a network with a still higher voltage, viz. 400 kV.

In western Europe, the international interconnexion of transmission and the exchange of energy (in both directions) between contiguous countries is very common. In many cases, the net supply of energy in a given year (difference between exports and imports) may be a small percentage of the total generation; during several short periods, however, substantial amounts of energy may have flowed in each direction. Had it not been for the interconnexion facility, the countries concerned would have had to incur heavy capital outlay on additional power plants.

In view of these experiences of the western countries, India has been giving serious consideration to the establishment of super grids. At present, the various state electricity boards have built up and operate grid networks more or less confined within the respective state limits. Instances have arisen of acute power shortages in one state on account of the depletion of the available water power resources, whereas a contiguous state has unutilized resources. Careful investigation showed that the country's power resources could be developed and utilized with better national advantage by the construction of extra high voltage transmission lines interconnecting transmission systems of contiguous

state electricity boards. It is proposed to divide the entire country into 6 zones. Each of the zones will have its own power plants and transmission networks; but the contiguous networks will be interconnected enabling bulk transfer of energy wherever possible and necessary. It is learnt that the Government now has under consideration the organizational, technical and financial questions connected with this development.

Nuclear power

Many countries in the region are showing keen interest in the possibility of using nuclear resources for power generation. Nuclear power has been established as a technically feasible proposition, but it has not yet been possible to make it economically competitive with conventional power. Opinions differ widely on this and other matters, but it is generally expected that the price of nuclear energy will gradually come down in the next few years and reach parity with conventional power in the early seventies.

Before nuclear power can be considered a practical proposition in any particular country, account has to be taken of the other available potential energy resources and the demands for electricity both on a short-term and on a long-term basis. Nuclear power stations have a higher capital cost than conventional plants of the same capacity; but the cost per kW of nuclear power plants decreases more rapidly with increase in size of the plant than that of conventional power plants. The expenditure on fuel as well as on operation and maintenance per unit capacity is also lower in the case of a large size plant. For these and other reasons, a nuclear power plant of small or medium capacity is not likely to be economical. It is felt that nuclear plants should be of 100 MW capacity or more, if they are to be economically competitive in the near future. Moreover, to make the most economic use of a plant, a high utilization factor is necessary. With a nuclear power station, this calls for a well-developed grid system with a variety of industrial, commercial and residential loads absorbing energy at an average load factor of 80 per cent or more. In other words, nuclear power is suitable only in those regions where it can be applied to meet a base load of 100 MW or higher in a well developed power system. Also, in order that supply may be maintained without very serious power cuts, even in the event of an unexpected failure of atomic power, it is desirable to keep the nuclear power capacity at a reasonably small proportion of the total capacity. The locations where nuclear power stations will be found economical are those which do not have the benefit of hydro power or are far away from the known coal fields, etc.

Several countries have initiated steps, which in due course, if not immediately, will lead to the establishment of nuclear power stations. As an integral part of the island's power system, the Taiwan Power Company proposes to install a nuclear power station by 1970. This station will probably be located in the southern part of the island where hydro-electric resources are rather scarce and may have a capacity of between 250 and 300 MW. By 1970, the Taiwan Power Company will have a total plant capacity of over 2 million kW, at which point it is considered feasible to introduce nuclear power.

At the Institute of Nuclear Science at the National Tsing Hua University, a one megawatt light water moderated and cooled and graphite and water reflected, 20 per cent enriched uranium fuelled open type research reactor has been built and is being used for agricultural and biochemical research. This reactor is incidentally providing much needed training and experience in the field of nuclear technology. The Taiwan Power Company has, in anticipation of the future need for trained personnel to deal with nuclear power problems, deputed several engineers for intensive training and study at the International School of Nuclear Science and Engineering.

According to available reports, India has now finalized the details of a contract with the General Electric Company of the United States for the construction of a nuclear power station of 380 MW capacity at Tarapur, about 100 miles north of Bombay. There will be two reactors of the boiling water type with an electrical output of 190 MW each, charged with slightly enriched uranium oxide. The high pressure steam generated will drive two 1,500 rpm tandem compounded turbine generators. The power generated will be stepped up to 230 kV and fed into the power systems of the Gujerat and the Maharashtra State Electricity Boards.

The foreign exchange costs of the project are estimated at about $80 million and the local costs Rs 162 million. It is proposed to meet the former by a loan from the United States AID. According to present indications, the project will be completed by 1967.

The Indian atomic power project at Tarapur is intended as a first step towards the development and utilization of the large deposits of thorium available in India. Thorium itself is not fissionable—it must first be converted into uranium 233. Starting with uranium fuelled reactors, the first stage will be to obtain plutonium as a fission by-product. By using this plutonium in plutonium-thorium reactors, thorium can be converted into uranium 233. Finally uranium 233 can be used in uranium 233-thorium reactors, which will not only produce the necessary heat for generating power but will also maintain the convertion of adequate quantities of thorium into uranium 233 to continue the reaction (breeder reactor). Thus at a later stage, continuous feeding of thorium will be enough to give the necessary power output.

India has also been considering plans for the construction of the second and subsequent nuclear power stations. A committee appointed by the Government of India has carried out investigations and reported on

suitable sites for future atomic power stations. It is proposed to build the next station in Rajasthan State, with the collaboration and assistance of Canada. The third power station is likely to be located in south India, as most of the known water power sites in Madras State have already been exploited and fuel resources are not available in that part of the country.

Japan is pursuing a vigorous nuclear research and development programme, sponsored by the Government and effectively supported by private industry. Japan's first atomic reactor intended for research purposes went into operation in 1961 and subsequently several more were completed for research purposes.

The chief objective of the Japan Atomic Energy Commission has been the application of nuclear resources for electric power supply. Following the experience gained in the construction and operation of several experimental reactors including JRR III, a natural uranium fuelled reactor with an energy output of 10,000 kW, the construction of a 166,000 kW nuclear power plant at Tokai village in Ibaraki Prefecture (100 miles north of Tokyo) is now on hand. This plant, which is being supplied by the General Electric Company of the United Kingdom, will be of the improved Calder Hall type using natural uranium as fuel. The estimated cost of the plant is about $98 million. It is expected that it will be commissioned in 1964.

The demand for electric power in Japan, as in all other countries, shows no tendency towards saturation. According to present forecasts, the demands in 1970 and 1980 will be 280 per cent and 500 per cent of the demand in 1960. This calls for a large-scale installation of additional power plants. Much of the potential hydro-electric resources of Japan has already been harnessed and it is not expected that more than 15 or 20 MW hydro capacity will be possible by 1980. Naturally, the country has to think in terms of thermal power using coal, oil or nuclear fuel. The rate of progress of nuclear power stations will largely depend on the economic trends of the construction and operation of conventional plants as well as on the experience of the nuclear plants now under construction.

With the prospective improvement of the economics of nuclear power plants, the nine power companies of Japan have included atomic power in their development programmes. The Tokyo Electric Power Company, the Kansai Electric Power Company, the Chubu Electric Power Company and the Tokoku Electric Power Company have between them plans for the construction of nuclear plants with a total capacity of over a million kW by 1970. To be able to meet the plant and equipment requirements of such a programme, major electrical manufacturing firms such as Hitachi Ltd., Tokyo Shibaura Company, Mitsubishi Electrical Manufacturing Company, Meidensha Electric Manufacturing Company, Furrukawa Electric Company and the Fuji Denki Seizo Company have started large-scale research and development work.

In Pakistan, the feasibility of using nuclear fuel for electric power generation was one of the several problems entrusted to the Power Commission established by the Government to make an over-all study of the present status, future requirements and the organizational aspects of the electricity supply industry and to make recommendations to the Government on the measures to be taken. It is reported that the question of using atomic power both in East and West Pakistan was examined by consulting engineers appointed by the Government. Subsequently, an IAEA Mission visited Pakistan (20 – 31 January 1962) to study the possibilities of nuclear power generation. It would appear that the conclusion drawn from these studies is that there is a *prima facie* case for the construction of atomic power plants both in East and West Pakistan.

A case study mission organized by the International Atomic Energy Agency investigated the technical and economic aspects of nuclear power generation in the Philippines in November 1960; according to its report, there is a *prima facie* case for building a nuclear power station in the Manila region with a capacity of 150-200 MW during the early seventies. The Mission recommended that further detailed studies should be undertaken towards this objective.

Between 1965 and 1975, the installed capacity of the Luzon grid is expected to increase from about 840 MW to 2,400 MW. Of this increase, about 1,000 to 1,200 MW will have to come from thermal generation and the annual foreign exchange expenditure for the importation of oil fuel alone will amount to US$25 million per year, apart from the large capital investments that will be needed. Hence it is considered essential to examine the relative economics of alternative methods of generation such as those based on nuclear fission.

On an application by the Philippine Atomic Energy Commission submitted through the Government, the United Nations Special Fund has recently agreed to help finance a comprehensive pre-investment study of this problem, the estimated cost of which will be US$458,000 (to be financed by the Special Fund) and P1,450,000 (being counterpart local funds to be provided by the Government of the Philippines). It will cover the following major subjects:

(*a*) Detailed analysis of the conventional energy resources in the island of Luzon, including hydro-electric resources, coal, oil and gas deposits, geothermal sources, etc.;

(*b*) Detailed analysis of the demand for electric power up to 1975;

(*c*) Formulation of a power development programme for 1965-75 to meet the needs of the Luzon grid and to determine the capacities and schedules of construction of the various plants;

(*d*) Detailed assessment of the costs of power generation from conventional and nuclear resources and

an attempt to make an economic comparison taking all relevant factors into account;

(*e*) The problem of siting nuclear power stations;

(*f*) Integrated operation of a nuclear power station with conventional hydro and thermal stations;

(*g*) Technical manpower requirements and training programmes;

(*h*) Development and drafting of appropriate atomic energy legislation to cover nuclear power.

In carrying out this pre-investment study, the Philippine Atomic Energy Commission has secured the co-operation of the National Power Corporation and related agencies.

The Commission recognizes the importance of ensuring an adequate supply of trained scientists, engineers and technicians as well as large-scale maintenance facilities such as engineering works. Not only does it hope to secure facilities for Philippine nationals for training in western countries, but the 1,000 kW reactor now in the final stages of construction at Manila is expected to provide a valuable training ground for the technical and scientific workers.

Generally speaking, all the countries of the region are keenly interested in the useful applications of nuclear energy; the emphasis in many cases is in the use of radioactive isotopes in the field of medicine and agriculture. As far as nuclear power is concerned, those countries in which a sizeable power development programme has already been completed and where the future prospects are that conventional power generation will be expensive, have naturally shown interest in the development of atomic power. There is no doubt that, in the years to come, nuclear power will form a significant portion of the total electricity output of many of the countries of the region.

Need for advance planning and programming

Despite all the efforts being made by the countries of the region, it has been the general experience everywhere that the demand for power is continually ahead of the available supply capacity. This arises not only because of unforeseen increases in demand, but also because of difficulties and delays in the achievement of targets for the construction programmes. Estimates of load demand have almost without exception proved to be on the low side thus calling for frequent revisions of the development and construction programmes. In the actual execution of the various projects, the difficulties and bottlenecks hampering the smooth progress of work have been considerable. The cumulative result of all these is to put back the dates of commissioning of the projects, with adverse repercussions for prospective power consumers. There is a general recognition of the crucial importance of electric power as a factor in the economic infrastructure so essential to a country's development, but the recurrent power famines in several countries of the region are, perhaps, pointers to the need for more adequate concerted measures to promote power development programmes. Power development programmes must be worked out on a reasonably long-term basis. Under conditions obtaining in many countries of the region, a major power project may take five to seven years for execution after the date of sanction. On the other hand, most manufacturing industries could be established within two or three years. Clearly then, it is of utmost importance that the plans for power supply (which have necessarily to be co-ordinated with the growth of industries) and the construction of power facilities have to be undertaken much in advance of the establishment of industries. It is essential that all important decisions relating to a project — administrative, financial and technical — be taken well in advance and that procedural rules be framed in such a manner as to avoid hold-ups and difficulties of a routine nature.

The Electric Power Survey Committee of India has taken special note of this aspect. India has been suffering from an alomst chronic power shortage during the past several years. According to published information, the Electric Power Survey Committee has pointed out to the Government the imperative need that measures for augmenting the generating capacity at various centres be taken sufficiently in advance. It is proposed to sanction and commence work right away on power projects intended to meet the power demands expected to arise in the first two years of the fourth plan.

In recognition of the urgency and importance of taking concerted measures to promote the orderly development of the electric utility industry in the country and thereby effectively assist the economic and industrial growth, Iran has taken some significant steps. In January 1963, the Government established the "Iranian Electric Authority" charged with the sole responsibility of regulating, supervizing and controlling the electric supply undertakings in the country in the public interest, and also with taking all steps considered necessary to promote accelerated electric power development to meet the national needs. In discharging its responsibilities, the Authority is empowered to issue licences to persons and companies for carrying on the business of electricity supply. It is visualized that, after undertaking the necessary studies, the Authority will determine appropriate service areas and establish area electrical utilities which will develop into extensive interconnected grid systems. The Authority will endeavour to prescribe financial principles for the guidance of the electric supply industry and will also fix and approve tariff rates. Many municipalities and local authorities in Iran have been levying local taxes on the consumption of electricity and there is a general impression that this is proving a serious handicap to the healthy growth of the industry. The Iranian Electric Authority has powers to investigate these questions and make recommendations to annual or

modify these taxes. It is also provided that Government agencies wishing to install generating plants for power supply to specific industries in their control are required to obtain the prior approval of the Authority, so as to avoid haphazard installation of electric power plants. It is expected that the Authority, armed with the special powers and facilities entrusted to it by the Government, will be able to reorganize the electric supply industry on sound lines and also plan for effective and adequate power development on a long-term basis.

Pattern of electricity consumption

Want of reliable and detailed statistics on electricity consumption precludes a worthwhile analysis to ascertain the trends of consumption of electricity by different classes of consumers and the correlation between the use of electricity and the indices of industrial production, etc. Nevertheless, on the basis of the available data, it is possible to make certain broad observations.

The difference between the energy generated and that sold to the ultimate consumers is accounted for by the consumption by power stations and substation auxiliaries and energy losses in transmission, transformation and distribution lines. (Energy supplied free of charge may be included under energy sold for the purposes of a technical study). It is needless to stress that every effort should be made to keep the percentage energy losses as low as possible. It will be of interest to compare the experience of the countries of this region in this regard with that of European countries.

The figures in table 5 refer to over-all country-wide supplies of electrical energy and it may not be justifiable to draw specific conclusions pertaining to any area. However, it would seem that the energy losses in transmission and transformation are rather high in some of the ECAFE countries in which the development is relatively small. The reasons for such high energy losses may be several—inadequate transmission and distribution facilities, poor voltage regulation, and obsolescence of distribution systems in the context of the nature and demand of present-day requirements. In all these cases, much can be gained by a careful investigation of the layout and working of the transmission and distribution systems followed by appropriate measures to reorganize the installations and improve the operating conditions.

As regards the utilization of electricity, industrial consumers contribute nearly 70 per cent or more of the offtake particularly in China (Taiwan), the former Federation of Malaya, India, Japan and Pakistan. This does not in all cases necessarily mean that the countries have reached a high degree of industrialization, but it indicates the importance attached to the use of electricity for productive purposes as against its use for providing amenities and comforts. The use of electricity for domestic and commercial purposes can perhaps be roughly correlated with per capita income.

In those countries in which the public electricity supply has not yet been developed to meet the demands of all categories of consumers, it has been the common practice for industries, including very small undertakings, to install their own power plants. In the case of small undertakings, this is obviously not an economic arrangement. The need for adequate spare plant capacity, poor plant factor conditions, inadequate skill for maintenance, and the generally increased cost of operation are all factors which should be given careful consideration in this regard. In general, it will be in the interest of the industrial undertakings to take power supply from a public utility undertaking. The circumstances which have compelled small industrial undertakings to establish their own power plants, the reasons why the public utilities have been unable to give or uninterested in giving supply to these industries, and the steps which may be taken to promote economic public utility supplies in the national interest are questions which governments may care to examine. If they consider it appropriate, governments may decide to take a policy decision, as some have actually done, that unless there are overriding reasons, industries should take power supply from the existing public utilities and that it is the responsibility of the public utilities to endeavour to meet the requirements of the present and prospective power consumers as satisfactorily as possible.

Table 5.

ENERGY LOSSES IN PUBLIC SUPPLY SYSTEMS IN SELECTED COUNTRIES

Country (1)	*Energy consumption by station auxiliaries as a percentage of total generation* (2)	*Energy available for supply to consumers (million kWh)* (3)	*Losses in transmission and transformation (million kWh)* (4)	*Column (4) as a percentage of column (3)* (5)
Countries in the region, 1962				
Australia[a]	[b]	23,056.7[c]	3,948.6	17.1
Burma	4.1	309.0	48.1	27.2
Cambodia	3.6	76.9	16.8	21.8
Ceylon	1.3	327.6	55.8	17.1
China (Taiwan)	3.4	4,692.7	627.7	13.4
India	4.1	21,920.8	3,245.8	14.8
Japan	3.6	119,496.0	11,854.0	9.9
Korea, Republic of	4.4	1,890.9	421.7	22.3
Malaysia: Former Federation of Malaya	4.9	1,358.0	82.0	6.1
Nepal	1.0	11.3	2.5	22.1
New Zealand	1.0	7,874.0	1,190.0	15.1
Pakistan	4.1	2,212.6	496.9	22.5
Philippines	[b]	3,010.1	480.6	16.0
Thailand	6.0	658.1	123.4	18.8
Countries outside the region, 1961[d]				
France	...	54,552.0	6,633.0	12.15
West Germany	...	70,396.0	7,883.0	11.2
Sweden	...	38,330.0	4,320.0	11.25
U.K.	...	121,783.0	13,156.0	10.8
U.S.A.	...	791,975.0	72,665.0	9.2
U.S.S.R.	[b]	327,000.0[c]	40,834.0	12.5

[a] Relating to fiscal year ended June 1961.

[b] Included in column (4).

[c] Gross generation.

[d] No data available for the year 1962, therefore 1961 figures were given here.

B. PROGRESS OF ELECTRIC POWER DEVELOPMENT IN THE COUNTRIES OF THE ECAFE REGION, 1961 AND 1962

AFGHANISTAN

Introduction

Afghanistan is a land-locked and mountainous country situated on the north-west of the Indo-Pakistan sub-continent. With a total area of about 640,000 sq km, it has a population of 14.6 million. The rainfall is scanty, but numerous snow-fed rivers and streams which cascade down sharp slopes and precipitous falls on their way to the plains, can be harnessed for power production. At present, only a few of the several potential sites have been harnessed for power generation. The total hydro-electric potential has not been systematically surveyed and assessed, but extensive investigations and surveys to ascertain the potential water resources of the country are now in hand under the aegis of different agencies. The completion of the investigations would undoubtedly provide useful data for the formulation of water resources development projects on the various river basins.

A development of considerable significance to the energy economy of Afghanistan is the recent discovery of natural gas in the region of Mazar-i-Shariff. No precise estimate of the probable or proved reserves is yet available, but they are believed to be substantial; production at 1,500,000 m^3 per day was reported in 1961 at a well in Shibarghan. Further surveys and investigations are now in hand with a view to making the best use of this national asset. The natural gas can be used not only in manufacturing industries such as fertilizer and chemicals but also as fuel in thermal power stations. It is believed that power generated in natural gas fuelled thermal power stations will be economically attractive.

Present status of power development

Among the existing electricity supplier in the country, the Afghan Electric Company is the largest and the most important. This company, the major part of whose stocks is held by the Government, owns and operates all the important public utility plants and installations. Besides the Afghan Electric Company, a few municipalities also operate small public utility plants. Some textile and cement companies have installed power plants for their own use, but are permitted to sell surplus power to the public. The Government agency responsible for electric power development is the Ministry of Mines and Industries which, besides controlling and regulating the electric supply industry in the country, undertakes directly the execution of all new and major power projects from the early stages of negotiations with foreign governments or agencies on technical and financial aid up to the completion of the construction and commissioning of the power plants. Thereafter, the projects are turned over to the ownership of the Afghan Electric Company for operation and maintenance.

The aggregate installed capacity of all electric power plants including self-generating industries amounted to 60.3 MW in March 1963 (end of Afghan year 1341), comprising 47.9 MW of hydro-electric plants and 12.4 MW of thermal plants including diesel and steam power plants. The largest station is the Sarobi hydro-electric station located about 65 km from Kabul. The Kabul river is diverted by a barrage into a 3 km tunnel whence the water drops down to the power station, which is presently equipped with two 11 MW units with provision for a future addition of two more units of the same capacity. Transmission lines at 110 kV connect this station with Kabul city and with Gulbahar, where a new textile mill has been built.

The most important load centre is Kabul city which is fed by two sources—a local diesel engine station and the Sarobi hydro-electric station. The present distribution system at Kabul, designed and built to suit conditions which existed several decades ago, has been found to be wholly inadequate; the voltage regulation is very poor, line and transformer losses are very high and interruptions to the supply are annoyingly frequent. It is a matter of urgency therefore to carry out a comprehensive reconstruction of the distribution system. It is reported that a reconstruction project has been worked out with the help of a West German firm to modernize the distribution system and augment its capacity to about 40 MW. The primary distribution voltage will be 15 kV and the low voltage supply will have the standard 400/230 V three phase 4-wire system. The estimated cost for reconstruction is 12,378,000 DM.

Another question which calls for urgent attention is the problem of power system frequencies. At present, arising from historical and other causes, two frequencies are employed; the recently built stations operate at a frequency of 50 cycles per second, whereas most of the old stations operate at 60 cycles per second. Within the city of Kabul, both frequencies are in use; consequently the Sarobi hydro-electric station cannot be paralleled with the local diesel station. It is obvious

that this is a serious impediment to rapid power development. Planned action should be initiated immediately to withdraw gradually all plants now operating at 60 cycles per second and standardize on 50 cycles per second.

The Government is pursuing measures to augment and improve power supply facilities in the country as rapidly as possible. During the first five-year development plan which ended in March 1961, power plants with a total capacity of 32,800 kW (26,400 kW hydro, 2,700 kW diesel and 3,700 kW steam) were commissioned, involving a total investment equivalent to US$11.0 million. The most important station completed in this period was the Sarobi hydro-electric project together with the 110 kV transmission lines. During the Afghan official year ended March 1962, three stations were completed viz. the 9 MW Pul-i-Khumri II hydro station. the 0.7 MW Filco hydro station and the 0.25 MW Ghazni diesel station. These plants together with the plants included in the first plan raised the total installed capacity of the country from about 14 MW in March 1956 to about 59 MW in March 1962 and production from 29 to 123 mililon kWh respectively. During the Afghan year 1341 (21 March 1962 to 20 March 1963), only a few small diesel stations with an aggregate capacity of 1.3 MW were added but the total electricity production increased by 30% to 160.5 million kWh during the year. It may be of interest to mention here that the largest station, Sarobi, operated at an over-all plant factor of 57 per cent during the year ended March 1963.

Programme of future development

The second five-year development plan commenced on 21 March 1962. The power programme under the plan includes five major hydro projects and one thermal project. The Naghlu and Darunta hydro projects are under construction, and the other projects are under active consideration.

The Naghlu hydro project is also on the Kabul river upstream from the Sarobi project. It involves the construction of a 103 metre high dam which will be the biggest dam in the country. Below the dam will be the power plant in which four units (ultimate) each with a capacity of 22.5 MW will be installed. The power plant will have an output of 90 MW under high water conditions and 50 MW under low water. The annual energy generation in a good year will be 400,000 million kWh. The estimated cost of the project is US$15 million and it is being financed with assistance from the Soviet Union. The regulated water discharged from Naghlu power plant will provide additional power output at Sarobi power plant where two more units will be installed. The Naghlu station will feed its output into the Sarobi grid, thus supplying Kabul and its surrounding areas. The construction was started on 9 August 1960.

Another project now under construction is the Darunta multi-purpose project near Jalalabad downstream from Sarobi on the Kabul river, which is also being undertaken with the assistance of the Soviet Union. It includes the building of a power plant of 12 MW capacity which will meet the requirements of the Jalalabad region.

Among the various other schemes under consideration are the following:

Mahipar hydro project: This project is on the Kabul river upstream from the Naghlu project. It includes a dam on the Kabul river to divert water into a 3 km long tunnel and then to an underground power house which will be equipepd with two 18.5 MW units. A tailrace tunnel 500 metres long will lead the water back into the Kabul river downstream. The estimated cost is around US$9 million.

Power plant for Argandeb dam: At Argandeb near Kandahar, a multi-purpose dam was recently built with assistance from the United States. It is proposed to build a hydro power plant under the dam with 14 MW capacity so as to provide additional reliable electric supply to Kandahar, which is the second largest city in Afghanistan.

Kajaki hydro project: The project is located in Helmand valley in the south-west of the country. The proposal involves a power plant of 120 MW which will benefit Helmand valley as well as the Kandahar region.

The Mazar-i-Shariff thermal project: It is proposed to utilize the natural gas recently discovered in the Mazar-i-Shariff region for a 24 MW thermal power station and for a chemical fertilizer plant.

AUSTRALIA

Introduction

Australia is a commonwealth consisting of six States and three Federal Territories. Unlike many other countries of the ECAFE region, there is no national electricity authority; each State government has jurisdiction over a number of functions within its own boundaries, including electricity supply. The Federal Government deals with electricity supply in the Federal Territories but in addition, has by agreement with the states of New South Wales and Victoria established the Snowy Mountains Hydro-electric Authority for implementation of the Snowy Mountains Scheme. This Scheme will be operated by a council on which all parties to the agreement are represented and the electrical output will be used to supply the Australian Capital Territory and the State power systems of Victoria and New South Wales.

The electric power systems in the State are essentially publicly owned and the organizational development has followed a similar pattern in all cases. Each State has now established by legislation a central authority

to plan, regulate and control electricity supply. In all States, the transition from local generation and supply to an integrated grid system within the State has now been largely achieved. A few local area boards and councils still operate separate power stations in more remote regions and in some States distribution remains a function of the local area authorities, but over 90% of the consumers are now supplied through the main generation and transmisison systems of the six States.

Because of the geographical distribution of Australian population centres, which are concentrated close to state capital cities at intervals of 800 to 1,400 km along the eastern and southern coastal fringes of the continent, separated by areas of low load density, only the New South Wales and Victoria State systems have been interconnected. In this case the interconnexion was achieved at low cost as both States receive power at 330 kV from the Snowy Mountains Scheme which lies about mid-way between their main load centres.

Electricity supply association of Australia

In the absence of a national agency to co-ordinate the development of electric power supply facilities, a country-wide organization known as the Electricity Supply Association of Australia has been set up to pursue such measures as may be necessary in the development of electricity supply.

The objects for which the Association was established are:—

(*a*) The free exchange by conference, correspondence and other means, of technical, commercial and administrative information relating to electricity undertakings and authorities.

(*b*) To do all such acts and things as the Association may consider to be incidental to or to be in furtherance of the national interest in the development of the supply of electricity and its use, including, *inter alia:*—

(*i*) To provide facilities for the interchange of views and information regarding the control of electricity supply which will assist members who are authorities charged with the administration of such controls to co-ordinate their activities.

(*ii*) To collaborate with and advise the Standards Association of Australia in all matters relevant to the supply and use of electricity.

(*iii*) In collaboration with any other body having similar objectives, to promote the formulation and implementation of standards with respect to the supply and use of electricity and electrical apparatus.

(*iv*) To assemble and make available information and advice on any matter relevant to the supply and use of electricity.

(*v*) To facilitate the collection of adequate statistics of the electricity industry.

(*vi*) To assist, financially and otherwise, research into any or all aspects of the supply and use of electricity.

To carry out the objects of the Association more effectually, the activities of the Association are divided into the following sections:—

Section No. 1—Generation

Section No. 2—Transmission and distribution.

Section No. 3—Accounting, office systems and the like.

Section No. 4—Commercial developments, tariffs, and public relations.

Section No. 5—Personnel and welfare.

Investigational work is performed by committees of the Association and/or the Sections.

Membership of the Association is open to:—

(*i*) Any State authority constituted by statute for the purpose of regulating or controlling the supply or use of electricity throughout the State.

(*ii*) Any properly constituted body generating, transmitting or distributing electricity for public supply under statutory authority.

Present status of electric power development

According to the available statistical data, the total installed generating capacity of the electricity supply industry by the end of June 1962 was 7,215 MW comprising 1,826 MW of hydro plants, 5,165 MW of steam thermal plants and 224 MW of internal combustion plants. The total energy generation during the year ended June 1962 was 25,453 million kWh of which the contribution of hydro stations amounted to 4,968 million kWh.

These figures indicate that electricity generation in Australia is essentially based on thermal power plants, except for the island state of Tasmania where hydro-electric power supplies all needs. Australia is a very dry continent with few hydro-electric resources in relation to its area.

On the mainland, the limited hydro-electric resources are being developed mainly to supply peak load requirements, which will probably never represent more than

about 10% of electrical energy demand. The Snowy Mountains Scheme, which is ultimately to have a capacity of 3,000 MW, will provide this form of supply. The Scheme has been designed to operate at an average annual load factor of about 20% and requires the installation of 3 kW of thermal plant for each kW of hydro plant to ensure that the capacity is firm in the New South Wales and Victoria systems.

Thermal generation in Australia is based primarily on coal. Large deposits of black coal and brown coal (lignite) are available, known reserves being adequate for at least the next 100 years.

The distribution of coal resources is however, by no means uniform, so that fuel shortages will arise in certain areas within the next 10 years, making the utilization of oil fuels and nuclear power in coal-deficient states more attractive than at present.

With regard to size of steam units, the largest machine in service is of 200 MW capacity, while 350 MW machines are under construction and will be in service by 1965. These are black coal fired plants. The largest brown coal burning unit in service is of 120 MW capacity but the first of six new 200 MW brown coal burning units will be commisisoned in early 1964. Boilers for the latter units will have an evaporative capacity of 1,650,000 lb/hr and are of special design to permit satisfactory combustion of the low calorific value brown coal, which ranges in moisture content from 64% to 68%.

Future developments

As in other ECAFE countries, load growth is expected to continue undiminished during the next decade. State and federal power authorities are planning to double their present plant installation in the next eight to nine years. This will involve installation of some 7,000 MW of new plant, of which about 2,000 MW will be hydro and 5,000 MW steam plant.

Among the individual stations of particular note that will be commissioned in the next decade are:

Snowy Mountains hydro plants, 1,500 MW
Hazelwood steam station, 6/200 MW units
Vales Point steam station, 3/200 and 1/275 MW units
Munmorah steam station, 4/350 MW units

These stations will all serve the interconnected New South Wales and Victoria systems where the present combined capacity is 4,300 MW. In addition, steam and hydro capacity in somewhat smaller blocks totalling 2,000 MW will be required for the other state and federal systems.

Rural electrification

Some 95 per cent of the Australian population is now served by public utility power stations. The per capita electricity consumption is about 2,000 kWh per year. In terms of area over which electricity is available, however, the coverage is only about 10 per cent of the Australian continent; this arises from the nature of distribution of the population in the country.

The growth of rural electrification in Australia has followed a similar pattern in all States. Initially, local generating stations were established primarily to meet the demands of towns and cities whence radial lines were extended for a few miles to serve the surrounding rural population. In the next stage, when central authorities were established to plan and co-ordinate electricity supply, it was possible to interconnect economically isolated supply systems into a grid system and this provided extended scope for serving rural areas. In the third stage, a positive effort was made to extend supply throughout the farming and rural area including places to which extensions would not be economically justifiable.

Rural electrification in Australia has received government and other assistance in various ways. Subsidies have taken the form of uniform tariffs at bulk supply points, advances to local distribution authorities of loans carrying low interest rates, and in some cases direct subsidies of transmission and distribution costs.

A self-help scheme has been adopted in the states of Victoria and Western Australia, whereby prospective rural customers can obtain supply at a date earlier than would otherwise be possible with funds available, by advancing the capital for high voltage extensions. This capital loan with interest is repaid over a ten-year period, or offset against the customer's power bills. The scheme has been very popular during periods when the supply authority has been short of capital funds.

BRUNEI

Introduction

The State of Brunei has a total area of 2,500 sq miles and a population of about 84,000 (1960). The country is largely mountainous and forest-ridden; much of it has not been reconnoitred. Almost all the population lives along a coastal belt which is not wider than about 20 or 30 miles.

The economy of the State is chiefly sustained at present by the oil industry in Seria owned and managed by the Brunei Shell Petroleum Company. The Brunei Shell Petroleum Company which has been operating the oil fields in Seria for the last fifty years contributes about 80 per cent of the gross national product of the country. In this connexion, it is significant that, during the last few years, the oil revenues have been dwindling. The value of production in the oil and gas industry dropped from M$ 293.2 million in 1955 to M$ 243.1 million in 1962. It is understood that, unless new oil wells are struck in the near future, there is a likelihood

of the gradual reduction of oil production with correspondingly adverse effects on the country's economy. Thus it is a matter of urgency to take steps to diversify the economy.

Present status of electricity supply

Public electricity supply in the State of Brunei is the responsibility of the State Electrical Department, which owns and operates power plants and/or distribution facilities in 6 townships, viz. Brunei Town (the capital), Tutong, Muara, Temburong, Kuala Belait and Seria. At Kuala Belait and Seria, the Department distributes energy purchased in bulk from the Brunei Shell Petroleum Company. At all other centres, diesel engine driven power stations have been installed. The largest of the power plants owned by the Department is at Brunei Town aggregating to 3,729 kW. The plant capacities at Tutong, Temburong and Muara are 375 kW, 56.5 kW and 105.5 kW respectively. The installed capacity of the power plants of the Brunei Shell Petroleum Company comprises two 3,000 kW steam turbine units, one 4,850 kW and one 4,500 kW gas turbine units and three 500 kW gas engine sets. The Brunei Shell Petroleum Company makes available bulk supply to the State Electrical Department both at Seria and Kuala Belait, the total capacity of the transformers installed for this supply being 2,100 kVA.

In all, the combined installed capacity of public utility power stations at the end of 1962 amounted to 4,266 kW—an increase of 1,105 kW over the capacity of 1960. The electricity output, including the bulk supply from the Petroleum Company rose from 9.2 million kWh in 1960 to 11.1 million kWh in 1962. Energy purchased in bulk from the Petroleum Company amounted to 2.76 million kWh in 1962. The growth rate in electricity output was around 13 per cent in 1960 and 1961 and 8 per cent in 1962.

The energy generated by the Petroleum Company at its own power station was 51 million kWh of which 2.76 million kWh was sold to the State Electrical Department for re-distribution. Thus the generation by the Petroleum Company was over five times that of the Electrical Department and, with the use of natural gas for fuel, it is obvious that the Company is in a position to generate electricity at a much cheaper rate than the Department.

The Electrical Department takes bulk supply from the Petroleum Company through 33 kV lines constructed by the company from its power station to Seria township and Kuala Belait. The high voltage distribution lines of the Electrical Department operate at 11 kV and 6.6 kV. It will be desirable in due course to discontinue the use of 6.6 kV lines and also gradually to convert the existing 6.6 kV lines to 11 kV, so that all the high voltage distribution lines in Brunei may be standardized at 11 kV. The low voltage consumers are connected through a 400/230 V, 3-phase 4-wire system.

The total sales of electricity to the public by the State Electrical Department in 1962 amounted to 10.1 million kWh, of which about 90 per cent was consumed by domestic and commercial sectors. There is no significant utilization of electricity by any industry other than the petroleum industry. It is expected, however, that this situation will change as a result of the efforts now being made for the diversification of the national economy.

In relation to the population, the electricity output per capita nearly doubled within 5 years, i.e. from 67 kWh per capita in 1957 to 132 kWh per capita in 1962. Considering that this excludes the electrical energy used by the Petroleum Company and that bulk of the supply by the State Electrical Department is to the domestic consumers, it points to the relatively high living standards of the people.

The Government has under active consideration, proposals for the rapid and rational development of power supplies to help diversify and develop the economy of the State. It is felt that the present method of generation using diesel engines results in increased costs of generation and supply. The United Nations Panel of Experts on Rural Electrification, which had an opportunity in 1962 to study and review the electricity supply industry in Brunei, recommended that the possibility of using natural gas for power generation should be explored. Following the recommendations by the Panel, it is understood that the Government, in consultation with the Brunei Shell Petroleum Company, is endeavouring to work out a scheme under which the Petroleum Company's power plant at Seria will be augmented and a 66 kV line built between Seria and Brunei Town. Under this arrangement, the diesel plants at Brunei Town, Tutong, etc., will be closed down, as bulk supply from Seria is expected to be more economical.

BURMA

Present status of electricity supply

The completion of the 84 MW hydro-electric station of the Balu Chaung project at Lawpita in April 1960 raised the capacity of the electric power supply industry in the country to 190.5 MW. Thereafter, through 1961 and 1962, no significant new capacity was added. Nevertheless, to meet the increasing demand for power, the extension of transmission and distribution systems and the improvement of distribution facilities were vigorously pursued during the last two years. The total electricity generation increased from 254 million kWh in 1960 to 322 million kWh in 1962 at an annual rate of 13 per cent in 1961 and 12 per cent in 1962. In view of the efforts currently being pursued by the Government to develop the economy of the country, it is expected that the electricity generation will continue to rise at a higher rate.

The Balu Chaung hydro station has been the one major source of power supply in the country since it was put into commission; in 1962 it generated 205 million kWh which was equivalent to 64 per cent of the electricity output of the whole country. Much of this energy was transmitted through a 404 km long 230 kV line to Rangoon and its surrounding areas, the largest load centre of the country. Since the power from the hydro plant was made available to Rangoon, the thermal generating units in the two old stations in this city—the Ahlone and the Ywama—have been maintained and operated chiefly on a standby basis and to take care of unforeseen emergencies; the five 1,000 kW diesel generating sets at Ahlone station have been used only to supplement power supply during peak hours. The energy received from the hydro plant accounted for as much as 80 per cent of the total energy distributed in Rangoon.

Development progress and future plans

In Rangoon, the existing distribution system employing a voltage of 6.6 kV is very old and has become inadequate to meet the persistent growth of power demand. Suitable steps have therefore been taken to improve and reinforce this system, not only to meet the present requirement but also to provide for future needs. Under the second four-year plan commenced in 1961, provision has been made for the installation of a new ring main of underground cable network, as also a number of 33/6.6 kV primary substations and extension and improvement of distribution lines and associated installations. This reinforcement and improvement programme is scheduled for completion in 1964/65.

Soon after the commissioning of the generating plant under the Balu Chaung project and the 404 km long 230 kV line connecting the station with Rangoon, the construction of the 132 kV line about 362 km long connecting the power station through Kalaw with Mandalay in the north was taken up. This line has been completed and work on the substations at Mandalay etc. was under way during 1962-63.

Proposals for the extension of the transmission network in the second four-year development plan refer to the following links: (*a*) a 51 km long 66 kV line from Kalaw to Taunggyi in southern Shan state, (*b*) a 161 km long 132 kV line interconnecting Prome with Toungoo substation for the purpose of relieving the power shortage in Prome, (*c*) a 97 km long 132 kV line from Toungoo substation to Penwegon and (*d*) a 32 km long 66 kV line from Rangoon to Mokpalin.

It is also anticipated that the capacity of the existing 84 MW hydro station will soon be fully used up. The Government has, therefore, decided to proceed to the implementation of the second stage of the Balu Chaung project under the second four-year development programme. This second stage involves the creation of a reservoir at Mobye upstream from the present hydro station. Regulated flow from the reservoir will increase the inflow into the power station. A dam will be constructed to form the reservoir, and a penstock and three new 28 MW units will be added to the existing stations. The supply capability of the station will thus be raised to 168 MW. This second stage will be completed in four years time.

In the areas outside the hydro grid, diesel generating units have been added to meet the increasing requirement for power in the respective areas. Measures have been taken also to remove existing diesel stations in the hydro grid area and reinstall them in other undeveloped areas.

CAMBODIA

Present status of electric power supply

The Ministry of Public Works through its department known as "Service de Contrôle des Eaux et d'Electricité" has the over-all responsibility for the development of electric power supply facilities in Cambodia. At present, there are three agencies undertaking the supply of electric power in the country:—

(1) Electricité de Cambodge (E.D.C.)

(2) Franco-Khmer Electricity Company, Battambang

(3) Ministry of Public Works—Service de Contrôle des Eaux et d'Electricité.

Electricité de Cambodge operates as an autonomous company, but the majority of its shares are owned by the Government. It is managed by a board of eight members of whom six are nominated by the Government and two represent private interests. The E.D.C. owns and operates power supply facilities at Phnom Penh, Kandal, Kampot, Kampong Chan, Kratie, Kampong Thom, Siem Reap, Takao, Sihanoukville and Savoy Rieng. The Franco-Khmer Electricity Company is a private enterprise operating a diesel plant of 800 kW capacity at Battambang. The Ministry of Public Works also operates a large number of small diesel power plants at several centres, some of which are operated only during the evening and night hours to provide lighting. It is the intention of the Ministry of Public Works gradually to transfer these undertakings to the management of the E.D.C.

According to the available statistical data, the aggregate installed capacity of all electricity supply undertakings in Cambodia was 26,130 kW, 26,542 kW and 34,067 kW in 1960, 1961 and 1962 respectively. The corresponding figures for energy generation were 61.3, 74.2 and 82.3 million kWh. While the rate of increase of electricity generation is substantial, it is necessary to point out that nearly 80 per cent of the total electricity consumption was accounted for by domestic and commercial consumers. Some industries

operate power plants for their own requirements. The capacity and generation of these plants in 1962 are estimated at 1,200 kW and 1.8 million kWh respectively.

The system of power supply adopted in the past in Phnom Penh is proving to be a serious bottle-neck at present. There are two generating stations—one a diesel plant with ten generating units and the second a steam plant with two turbo-alternator sets. The steam station is designed for the standard 3-phase supply, but the diesel station operates on 2-phase 4-wire system. In consequence the system of distribution in one part of the city is 3-phase and in another part 2-phase 4-wire. To a limited extent, Scott-connected transformers are used to convert the 2-phase supplies to 3-phase, but the two generating stations cannot be operated in parallel to utilize their capacities to the full extent owing to inadequate breaker capacity. The authorities are understood to be giving active consideration to modifying the system according to modern standards.

Plans for future development

A basic prerequisite for working out plans for future power development is a knowledge of the requirements of power and the possibilities of utilizing power over a reasonably long period of time. As part of the investigations on the development of the Lower Mekong basin, a comprehensive power market survey has been initiated recently. The results of this survey, when completed, will be useful and can be developed for areas lying outside the Mekong rilver valley as well.

Cambodia has substantial water resources which can be harnessed for the generation of electricity as well as for providing irrigation and navigation facilities. These resources have hitherto remained largely unutilized. Cambodia is one of the four riparian countries of the Lower Mekong basin, the other three being Laos, Thailand and the Republic of Viet-Nam. The Governments of the four countries are anxious to develop this international river and have been actively administering the works in their respective areas. They are closely co-operating among themselves, with other countries, and with the various United Nations agencies through the Committee for Co-ordination of Investigations of the Lower Mekong Basin. During the past few years, the work on this scheme has been mainly on field investigations in the basin of the Mekong and its tributaries; twelve countries and eleven United Nations agencies, as well as two non-official organizations, have participated. The work has made good progress, especially the studies on some tributaries which require a relatively shorter time for investigation. It is expected that the construction of some of the tributary projects can be commenced in the near future, if the necessary financial resources can be made available.

In Cambodia, projects have been drawn up for hydro-electric development along the main Mekong river at Sambor, Tonlé Sap and Prek Thnot. At Sambor, which is located about 140 miles upstream from Phnom Penh, an installed capacity of 740 MW with a potential energy output of 4,500 million kWh is planned.

The Tonlé Sap is a river connecting the Great Lake to the Mekong river at a point upstream from and near Phnom Penh. The main purpose of this project is to prevent floods at Phnom Penh and in the deltaic area by diverting the peak of the flood flows along the Mekong river into the lake for storage during the flood period and later to release the stored water back into Mekong to maintain adequate flows during dry period. Power generation under this project will be seasonal and not of very great significance, but the project will provide other benefits such as irrigation and prevention of the inflow of saline water during the low water period.

The Prek Thnot project is located about 80 km to the south-west of Phnom Penh and will have an installed capacity of 19,000 kW. Besides providing irrigation facilities, the project will be able to produce 37 million kWh of electricity which can be transmitted and utilized economically in Phnom Penh. According to the present proposals, this project will be completed by 1966.

Another important project which is being pursued by the authorities is the Kamchai hydro-electric project in the south-western region of the country. It is expected that the installed capacity under the project will be about 50,000 kW and it will have an energy output of about 230 million kWh. It is proposed to build a network of 110 kV lines connecting the Kamchai and Prek Thnot projects with Phnom Penh, Takio, Kampot and Sihanoukville. Kiriram, the site of another small project (9,000 kW and 35 million kWh), is also expected to be conencted through a 66 kV line. The completion of all these projects will provide adequate power supply facilities in Phnom Penh and the south-western region of the country.

CEYLON

Present status of electricity supply

The electricity supply industry in Ceylon is wholly controlled by government or municipal institutions, the largest of which is the Department of Government Electrical Undertakings which fills the power requirements of Colombo, the capital, a large area in the south-western part of the country and the Jaffna peninsula in the north.

In Colombo there are two supply stations, namely the Stanley and the Pettah, which were first equipped with steam generating plants of 9 MW and 3 MW respectively. At Pettah, the capacity was augmented from time to time with the installation of diesel units having an aggregate capacity of 15 MW. The city of Colombo received its supply from these two stations until

1951, when the first phase of the Laksapana hydro-electric project (three 8.3 MW units) was completed and hydro-electric supply was extended to Colombo; thereafter, the generation from the two old thermal stations was reduced to a minimum. Subsequently, when the second phase (two units of 12.5 MW each) of the Laksapana project was completed in 1958, the steam units as well as the diesel units at the two stations remained almost idle, being only operated occasionally to meet short evening peak demands.

The Laksapana hydro-electric project is located in the south-west of the country; with its extensive network of transmission and distribution lines, it feeds power supply over the whole south-west region including Colombo.

In the Jaffna peninsula in the north, the Department of Government Electrical Undertakings is operating another small power network. A diesel station of 4,000 kW capacity was installed in 1958 at Chunnakam, mainly to cope with the increasing demand for power by industries in that area.

Another public undertaking is the Gal Oya Development Board, which is an autonomous body established mainly for the purpose of reclamation and community development in the valley of the Gal Oya (river) in the eastern part of the country. This Board is also authorized to undertake electricity supply in the valley, and in 1953 it put into operation a hydro-electric station having a capacity of 5,000 kW.

The electricity supply in the other regions of the island is undertaken by local authorities, such as municipalities and town councils, which operate their own small diesel stations or purchase power in bulk from the Department of Government Electrical Undertakings. In 1960, the aggregate capacity of diesel stations owned by such authorities amounted to 6,000 kW.

In 1959, 1960 and 1961, no new installations were made and the aggregate installed capacity of public power supply in the country remained at 94.2 MW throughout the three years; in September 1962, however, a new steam station of 25 MW capacity was put into commission at Grandpas by the Department of Government Electrical Undertakings, and this new station (together with some changes in the diesel installations) raised the combined generating capacity of the country to 118.4 MW in 1962.

The steam station (25 MW) referred to above is part of the further stage of the development of the Laksapana hydro-electric scheme. This project, which is in an advanced stage of execution, comprises the construction of a hydro-electric plant (two units of 25,000 kW) together the associated civil works, a 25 MW steam power plant at Grandpas near Colombo, and additions to the transmission system (54 miles of 132 kV lines, about 90 MVA of transformers etc.). The hydro station will utilize more fully the storage provided at the Castlereigh dam and also the hydraulic head between the dam and the existing Laksapana power station.

Following the commissioning of the 25 MW steam turbo alternator at Grandpas, the addition of a second 25 MW unit at this station has been taken in hand. According to earlier studies on the long-term development plans, the need for this plant was anticipated at a later stage to meet the seasonal variations in the output of the existing and projected hydro stations. However, as a result of the unexpectedly rapid increase in demand, it is now considered necessary to make the new unit available in 1964-65. With the completion of the schemes now on hand, the installed generating capacity will reach about 193 MW.

The generation of electrical energy increased from 289 million kWh in 1960 to 311 million kWh in 1961 and 351 million kWh in 1962, reflecting an annual growth rate of 7.6 per cent and 12.8 per cent respectively.

An analysis of the electricity consumption in 1962 according to the various categories of consumers shows that industrial consumers accounted for about 41 per cent (against 34 per cent for 1960) of the total energy sold. The consumption by commercial consumers was about 20 per cent, and of domestic or residential consumers about 15 per cent. The balance of 24 per cent was used for other purposes. In comparison with other developing countries, the percentage of industrial consumption appears low, but with the progress of the economic development programmes, this is bound to increase.

Future development programme

There are no known resources of coal or oil in Ceylon; the entire requirements of these fuels are imported. However, the hydro-electric power potential, though not very great, is expected to be adequate to meet the power needs of the country for several years. The topography of the island, with the central mountain ranges sloping on all sides towards the surrounding lowlands, is favourable for the establishment of hydro-electric power plants. Stream flows are largely seasonal owing to the monsoons, and therefore storage works are essential to regulate the water supply. No systematic surveys of the hydro-electric power potential of the country have been carried out, but estimates by different authorities at different times range between 500,000 and 1,500,000 kW. A recent estimate made by the Department of Government Electrical Undertakings places the probable power potential at 1,420,000 kW.

The programme of raising generating capacity in the country will necessarily depend upon the anticipated growth of demand for power. Long-term forecasting of power demand in Ceylon suffers from lack of adequate data. Nevertheless, taking into account all foreseeable factors, estimates made in 1957 indicated that total

electricity consumption would increase three-fold between 1958 and 1968. Subsequently, a revised estimate was made, taking into account the trends of growth of electric energy consumption in the various sectors of the economy and making appropriate allowances for a few power-intensive industries, such as the fertilizer industry. According to this revised estimate, the total energy requirements, which stood at about 289 million kWh in 1960, will rise to over 1,000 million kWh by 1967-68. In order to meet these requirements, it was considered necessary to instal additional generating plants amounting to 225 MW during the next few years.

It is understood that the future programme of development is under active consideration in the light of the above estimates and other recent studies on the urgent short-term requirements and necessary resources.

The Department of Government Electrical Undertakings has made detailed investigations on a number of power projects. Of 20 projects studied, six would have a total capacity of 855 MW, and generate annually 3,560 million kWh. The Department proposes to undertake the construction of these schemes with due regard to the load growth and to the availability of the necessary financial and other resources.

Detailed studies have been made on the Maskeliya Oya hydro-electric scheme. A dam on the Maskeliya Oya at Mousakelle will create the main reservoir for this project from which the water will be conducted through a tunnel to a 22.5 MW power plant at Theberton. The tail-race water from this Theberton power plant together with the flow in the drainage area below Mousakelle will be collected and diverted through a tunnel and penstocks to a new power station near the existing Laksapana plant. At this new Laksapana station, two generating units of 25 MW capacity will be installed with provision for a third unit. The tail-race waters from the new Laksapana station together with the discharge from the existing Laksapana power plant will all be collected in a regulating reservoir and diverted through a tunnel to the proposed Polpitiya power station which will have two machines each of 37.5 MW capacity. Thus the scheme as a whole will have an installed capacity of about 147.5 MW with provision for an additional 25 MW.

It is expected that the execution of this project will be undertaken in three stages commencing from the downstream end:— (*a*) diversion dam below the Laksapana plant and the Polpitiya power station—two units of 37.5 MW capacity; (*b*) diversion dam at Theberton below the Theberton power station, tunnels, penstock and two units of 25 MW capacity at the new Laksapana power station; (*c*) diversion tunnel from Mousakelle reservoir, penstocks and power plant (22.5 MW) at Theberton.

The first phase of this project is estimated to cost Rs 150 million (US$31.5 million) and will have an ultimate energy output of 316 million kWh.

Other hydro power schemes under consideration are:

Samanalawewa project	60 MW
Uda Walave project	5 MW
Mahaveli Ganga	220 MW in four locations.

Rural electrification

Rural electrification has also received due attention from the Government. The Department of Government Electrical Undertakings recently proposed, as an experimental measure, the construction of single-phase, single-wire, earth return lines for transmisison and distribution in rural areas. In this connexion, earth resistivity tests were conducted at a number of locations and negotiations were opened with the Department of Telecommunications with a view to reaching a workable agreement on the problem of electromagnetic interference between earth return power circuits and communication systems. It is learned that, so far, no satisfactory agreement has been reached and therefore the proposal to install single-wire ground return lines has not yet been adopted by the Department of Government Electrical Undertakings.

Rural electrification in Ceylon is carried out by the D.G.E.U. mostly in areas which are under village committees. These village committees usually suffer from inadequate financial resources and normally cannot contribute financially towards electricity supply. On the average, the Department of Government Electrical Undertakings receive in their capital budget allocation an amount of Rs 100,000 (US$21,000) per year for rural electrification schemes. This is hardly sufficient for one or two villages per year. The criterion for sanctioning rural schemes under this provision is somewhat rigid—a gross return of 20 per cent on the capital outlay has to be ensured. The prospective consumers are required to pay in advance Rs 150 each towards service connexion and the security deposit. It is reported that, up to 1962 only five villages had been electrified under this scheme.

With a view to accelerating the development of rural electrification, the Government sanctioned what was known as the '50 village electrification scheme' in 1962. Under this scheme, electrification of groups of villages totalling up to 50 was to be sanctioned on the basis of a gross return on capital outlay of only 5 per cent or more. It was the intention that the local expenses of the schemes would be financed by the American AID from the counterpart PL 480 funds and the Government would provide the foreign exchange component. The scheme provided not only for the distribution installations, but also the internal wiring for a given number of consumers in each village, the cost of which was to be recovered from the consumers along with the monthly energy charges. No special connexion charges to be made, but the consumer was merely to pay Rs 50 as security deposit against the payment of electricity bills.

By 1962, six villages had been electrified under this scheme, and estimates had been made for 25 more villages.

CHINA (TAIWAN)

The Taiwan Power Company, the majority of whose stock is owned by the central and provincial governments, has an integrated and interconnected power system serving the entire island of Taiwan. The power system has 32 hydro and thermal power stations which had an aggregate capacity of 923 MW at the end of 1962; this figure has since risen to about 1,048 MW. A north-south trunk transmission line at 154 kV (aggregate circuit length 1,162 km) and an east-west line at 66 kV (aggregate circuit length 1,182 km including other 66 kV subtransmission lines) form the back bone of the transmission system in the island.

The Company was founded in 1946 immediately after the Second World War. Reconstruction and rehabilitation was the main activity in the first few years, but after that initial period, the growth of electric power in Taiwan was spectacular. Between 1952 and 1962, the installed capacity increased from 305 MW to 923 MW, the generation from 1,285 million kWh to 4,684 million kWh, the total length of high voltage transmission lines from about 1,500 km to 3,431 km and the number of customers from 548,000 (1954) to 1,331,000. The per capita energy consumption in Taiwan in 1962 was 359 kWh, which is exceeded in the ECAFE region by Australia, Japan, New Zealand and metropolitan Hong Kong only.

The hydro-electric power potential of Taiwan is great, as can be expected from the topography and the heavy rainfall of the island, and the Taiwan Power Company has made good use of it. In 1962, there were 24 hydro-electric stations with an installed capacity of 538 MW in operation. These stations accounted for 58 per cent of the total system capacity (reduced in 1963 to about 50 per cent) and 46 per cent of the energy generation. An island-wide survey of the hydro-electric potential indicated a theoretical power potential of 12 million kW. The actual economic potential will be much less, but it is clear that there is still considerable scope for additional development of hydro-electric power. The survey identified in a broad manner the river valleys which could be investigated in detail.

At present, the Taiwan Power Company is proceeding with the Tachia River Valley Development. Two power stations at Tienlun (79,500 kW at present, being increased to 106,000 kW) and Kukuan (90,000 kW at present, being increased to 180,000 kW) are already in operation. The development of the Tachia Valley involves the construction of the Tachien Reservoir in the upper reaches of the river. The original scheme is to form this reservoir by a concrete arch dam 237 metres (778 ft) high and a rock filled dam at an excellent site in Tachien gorge. A regulated flow will be released to run a series of six plants with an ultimate installed capacity of 1,384,000 kW, utilizing a total drop of about 1,200 metres (about 4,000 ft), and also to irrigate about 53,000 hectares of land. These plants will include (1) a 360,000 kW underground station at Tachien immediately below the dam, (2) a 480,000 kW station at Chingshan, (3) a 180,000 kW underground station at Kukuan (90,000 kW completed), (4) the existing Tienlun station enlarged to 106,000 kW, (5) a 102,000 kW station at Ma-an, and (6) a 156,000 kW station at Shihkang. Application for DLF financing for the construction of the Tachien reservoir and its powerhouse has been approved, and a loan agreement was signed on June 21, 1961. Recent studies have indicated, however, that by lowering the dam height to about 207 metres (680 ft), the auxiliary dam may be dispensed with. Also, the Tachien and Chingshan stations may be combined into one power station of 680,000 kW. This will possibly reduce the ultimate installed capacity, but will provide the TAIPOWER system with more capacity at less cost by the end of 1968 and earlier realization of the large downstream benefits of the Tachien reservoir project.

In recent years, the Taiwan Power Company has added substantially to the thermal capacity of the system. Actually, the energy generated by thermal power stations exceeded the output of hydro stations in 1962. Shen Ao in the north and Nanpu in the south are the two large and modern steam stations. The largest generating unit now in operation in these stations has a capacity of 125 MW. According to the present load forecasts, it is understood that a unit of 200 MW will be needed at Shen Ao station by the spring of 1966.

A general review of the vital statistics of the Taiwan Power Company shows that the economics of operation, maintenance and management of the power system are very satisfactory. In thermal power stations, the average coal consumption per kWh generated has been reduced from 0.94 kg in 1952 to 0.48 kg in 1962. Similarly, the energy losses in transmission and distribution systems have been reduced from over 24 per cent in 1952 to 13.4 per cent in 1962. Operation and maintenance expenses have also been kept as low as possible. The number of consumers per employee increased from 100 in 1952 to 164 in 1962, and the number of kWh sold per employee was 210,000 in 1952 and 469,000 in 1962. In fact, it is estimated that the over-all operating expenses dropped from 1.22 US¢ per kWh in 1952 to 0.47 US¢ per kWh in 1962.

The Taiwan Power Company has made good progress in the field of rural electrification as well. It is reported that, arising from the land reforms introduced in Taiwan and owing to various favourable factors, there is increasing prosperity among the rural population. Electricity plays a leading part not only in providing amenities to the rural population, but also in improving their economic productivity. The Taiwan Power Company commenced a programme of rural electrification in 1954 in co-operation with the Sino-American Joint Commission on Rural Reconstruction and other government agencies. By the end of 1962, 1,118 villages had been electrified serving about 93,000 rural consumers. The rural consumers receive power supply at the same rates as the city dwellers.

HONG KONG

Organization of electricity supply

Electricity supply in Hong Kong has all along been under the ownership and management of private companies. In 1889, the Hong Kong Electric Company Limited was awarded an electricity licence by the Government for the supply of electricity in Hong Kong island. Subsequently, in 1901 the China Light and Power Company Limited was registered in Hong Kong to take over and operate a generating station in Canton. In 1909 the company sold its Canton undertaking, but meanwhile in 1903 it had set up a new station in Kowloon which thereafter became the main station for the supply of electricity in Kowloon, the New Territories and adjacent islands. Both companies have been operating thermal stations, using imported oil as fuel exclusively.

The supply of electricity is regulated by the Electricity Supply Ordinance of 1911 which now forms Chapter 103 of the Laws of Hong Kong. This Ordinance confers on the Governor-in-Council the power to make regulations covering safety of supply.

With a view to bringing the electricity supply industry under appropriate statutory control and regulation, the Governor appointed a Commission of Inquiry in 1959 to advise on the form and extent of control which the Government should impose on the electricity supply companies operating in the colony. The Commission recommended, as a result of its investigations, that the present companies should be replaced by a public authority responsible for generation, transmission and distribution in the entire colony. Recommendations were also made on the functions, responsibilities and powers of the suggested authority. Following these recommendations, the Government initiated negotiations with the two electricity companies. In the middle of 1962, it was reported that the Government and the two companies had reached an agreement in principle on an arrangement to merge the two companies. The arrangement would leave the management of the undertakings largely under private control and give adequate incentives for efficient operation, but would at the same time afford the consumer safeguards on matters of concern to him, in particular on tariffs, and would as far as possible ensure an adequate supply of power to meet the anticipated rapid increase in demand. The shareholders of the companies have not yet ratified this agreement, and it is believed that the matter is still under the consideration of the Government.

Power supply in Hong Kong island

The Hong Kong Electric Co., Ltd. supplies power on the island of Hong Kong from two power stations both located at North Point. The old 'A' station has a capacity of 92.5 MW and the new "B" station 90 MW. No new generating unit has been commissioned in 1961 and 1962, and the total generating capacity of the Company during the two years has remained at 182.5 MW. The 'A' station has 8 generating units, three of which operate at 200 psig pressure and five at 400 psig. The units in the 'B' station are designed to operate at 600 psig and 850°F. The over-all thermal efficiency of the station in 1962 was 22.92 per cent. In 1963, two more units of 30 MW each were put into operation at the "B" station, raising its capacity to 150 MW and comprising five 30 MW turbo-alternators and six 315,000 lb hour oil fired boilers. Anticipating a further increase of power demand in the island, proposals have been worked out to build another station at North Point—"C" station—which will be equipped with two 60 MW turbo-alternators and two oil-fired boilers.

The distribution network in Hong Kong was formerly based on 22 kV for main and 11 and 6.6 kV for secondary feeders. In order to bring the system into line with international standards and also to augment the distribution capacity in the system, it has been decided gradually to convert 22 kV facilities to 33 kV and 6.6 kV to 11 kV. In preparation for the change of transmission voltage from 22 to 33 kV, two 22/33 kV, 20 MVA transformers were installed during 1963. Also, the change-over from 6.6 kV to 11 kV has been completed in the western part of the island and is well in hand in the central and other parts.

Apart from augmenting the distribution capacity on Hong Kong island, the Company has also extended the supply to a thinly populated island of Lamma which is about two miles south-west of Hong Kong island. The first interconnecting submarine cable was laid and the supply to north Lamma commenced in December 1962; subsequently a second submarine cable was laid and the supply was made available to south of the island in 1963.

While the generating capacity was not augmented during 1961 and 1962, the energy generation recorded a substantial increase from 466 million kWh during 1960 to 596 million kWh during 1962 representing a 13 per cent increase per year. Peak load rose correspondingly from 103.3 MW in 1960 to 130.9 MW in 1962. Against the total generation of 596.3 million kWh, the consumption by station auxiliaries was 32.5 million kWh (5.45 per cent) and energy losses in transmission, distribution and transformation 43.9 million kWh (7.37 per cent). These figures show the high degree of efficiency of the power system. The pattern of electricity consumption has not changed; domestic, commercial and small power consumers accounted for as much as 82 per cent of the total energy sold in 1962.

Power supply in Kowloon and the outlying islands

Electricity supply in Kowloon and the new settlement areas including Lantan and other adjacent islands is undertaken by the China Light and Power Co., Ltd. In 1960, the Company operated two stations both located at Hok Yuen, facing Kowloon Bay. The total capacity

was 182.5 MW, one section operating at 400 psig and the other at 600 psig. In 1962, a new plant was put into operation with two 60 MW turbo-alternators and two 550,000 lb/hour boilers, the steam conditions being 900 psig pressure and 900°F temperature. The average thermal efficiency of the stations in 1962 was 27.39 per cent.

Along with the expansion of the generating capacity, the Company has enlarged its distribution capacity in Kowloon and extended supply to new settlement areas and new industrial areas which have recently been opened up. Progress has been made in extending power supply to rural areas; 100 villages in the New Territories have been provided with electricity on the same basis as urban dwellers. The primary (high) distribution voltages employed in Kowloon areas are 33, 11 and 6.6 kV. Supply is made to large consumers at 11 or 6.6 kV and to domestic and small consumers at 200 V single-phase or 346 V three-phase. The Company has proposals to augment the capacity of the distribution and transmission system by raising the network voltages. For instance, it is proposed to replace 33 kV by 66 kV and 6.6 kV by 11 kV. As a beginning, about 28 miles of 66 kV cables have been laid but are being operated at 33 kV temporarily.

To meet the future increases in power demand in its area, the Company has also drawn up plans to augment the generating capacity. Orders have been placed for two more 60 MW turbo-alternators including boilers and for switch gear, transformers and cables for the new 66 kV transmission system.

Energy generation at the Company's station rose from 835 million kWh in 1960 to 1,190 million kWh in 1962 which corresponds to a rate of increase of about 21 per cent in 1961 and 18 per cent in 1962, both being higher than the rate in Hong Kong island. This arises probably from the large growth of industrial loads in Kowloon, which accounted for as much as 45 per cent of the total annual electric energy sold in contrast with Hong Kong island, where domestic, small power and commercial consumers accounted for 82 per cent of the energy sold.

In the colony as a whole, the aggregate generating capacity increased from 365.2 MW in 1960 to 485.2 MW in 1962 and energy output rose from 1,301 to 1,786.9 million kWh during the corresponding period. The electricity consumption per capita was 477 kWh in 1962, this being the highest rate in the ECAFE region excluding Australia, Japan and New Zealand.

INDIA

Power development forms an integral part of the five-year plans which have been adopted as the basis of economic development programmes. The progress of power development since the commencement of the first plan in April 1951 is shown below:

	Addition to installed generating capacity (million kW)	*Financial outlay (million US$)*	*Total installed capacity in the country at the end of the plan period*
First plan 1951-56 . . .	1.10	630	3.4
Second plan 1956-61 . . .	2.20	1,100	5.6
Third plan 1961-63 . . .	1.22	2,300	12.5
Third plan 1963-66 . . .	5.78		

The actual achievements under the second five-year plan were below the targets and a shortage of power supply was therefore experienced in most areas. The provisions of the third plan were worked out on the basis of the anticipated industrial development in the country. To ensure effective implementation of the plan projects, steps were taken to allocate the foreign exchange required for the various projects. As far as possible, negotiations were initiated with international agencies such as the World Bank and with friendly governments to tie up the foreign exchange needs of the various power projects with specific arrangements for foreign aid.

Against the target of 7.0 million kW of generating capacity during the third plan, the actual achievement during the first two years of the plan was only 1.22 million kW. It is reported, however, that construction on many projects is in an advanced stage and, on this basis, it is hoped that the plan target may be largely achieved. In other words, it is hoped that the rate of introduction of generating plant between 1962-63 and 1965-66 will be more than thrice as high as the rate during the first two years of the plan.

The limited foreign exchange resources have undoubtedly been a major obstacle to rapid electric power development in India, but there have been several other difficulties arising from organizational and procedural arrangements. The shortage of experienced technical manpower has also been a serious bottleneck in the large-scale electric power development programme. There has been an imperative need to build up essential data regarding the probable requirements of energy with due regard to the planned economic development, and to relate these requirements to a co-ordinated programme of harnessing the natural energy resources.

With a view to making a systematic study of these and related problems, the Government of India set up two expert committees with international membership. The first committee, known as the Electric Power Survey Committee, was to concern itself chiefly with the electric power supply industry, and the second committee, known as the Energy Survey Committee, was to deal with over-all energy problems (vide para. 1 in page 7). The report of these committees is understood to be in preparation.

The various energy resources of India, as estimated at present, are indicated below:

(*a*) *Coal:* The estimated reserves of coal (proved, indicated, inferred) are of the order of 130,000 million

tons, out of which about 14,000 million tons are coking and blendable grades. The remaining reserves are of poor quality with high ash contents. The reserves of coal are mainly concentrated in the States of Bengal and Bihar, but there are a few outlying fields in Orissa, Andhra Pradesh, Madhya Pradesh and Maharashtra, where the coals are of the non-coking variety. Usable coking coals have been estimated to amount to about 2,500 million tons.

In order to conserve the limited reserves of coking coals, it has been decided to wash raw coal for the purpose of meeting the coal requirements of steel plants. The by-product coal obtained from coal washeries is of poor quality with an ash content varying from 35 to 45 per cent. As there is no other use for this grade of coal, the Government of India has decided, as a matter of policy, to utilize these by-product coals, otherwise called 'middlings', in large thermal power stations which are to be located as near to the coal washeries as practicable.

Tertiary coal reserves have been discovered in Assam (hard bituminous) and in Madras (lignite deposits at Neyveli). A large thermal power station with an initial capacity of 400 MW utilizing the lignite deposits as Neyveli is under installation.

(*b*) *Oil:* India has an area of about one million sq km of sedimentary rocks, which may be taken theoretically as 'potential for oil'. This constitutes nearly one-third of the country's total area. Of the regions explored for oil so far, the most promising are in the States of Assam and Gujarat. The proved reserves are estimated at about 100 million tons in each of these two areas. In 1963, the production of crude oil in the country is estimated to have been 2.18 million tons. By 1965-66, the production of crude oil is expected to increase to about 6.7 million tons. This will not be adequate to meet demands, however, and it is expected that some 11 million tons of crude will have to be imported in 1965-66. Refineries have been established in the country to produce various petroleum products from crude oil.

(*c*) *Natural gas:* The proved and indicated gas reserves are estimated at more than 32,000 million cubic metres, mainly in Assam and Gujarat. The gas is associated with oil to the extent of 100 to 200 cubic metres per ton in the oil-fields being explored in these regions. A gas turbine power station with an initial capacity of 69 MW is being set up in Assam to utilize part of the gas.

The oil and gas reserves proved so far are so meagre that they are not even sufficient to meet the numerous high priority requirements in the fields of transportation, chemical industry, etc.

(*d*) *Hydro resources:* A survey of the hydro potential of the entire country has revealed that it is possible to utilize hydro potential economically to the extent of about 40 million kW at 60 per cent load factor. The current development of hydro power is only of the order of about 2.5 million kW. This gives an idea of the vast scope for further development of hydro power. It is of special importance in India due to the inherent economy and relatively low foreign exchange requirements of hydro projects.

The basic principle in planning power development has, therefore, been to resort to hydro power wherever the schemes have been fully investigated and found feasible and to develop thermal power to a complementary extent to meet the demands for power.

(*e*) *Nuclear resources:* India is rich in nuclear minerals, particularly thorium. Reserves of uranium to the extent of about 2.8 million tons (ore containing 0.076 per cent uranium) have been located in Bihar. This is expected to yield about 2,000 tons of uranium, which is equivalent to 80 million tons of coal with a calorific value of 9,000 B.T.U. per lb. A uranium mill is being set up in Bihar to process the ore.

The reserves of thorium are quite larger; they have been estimated at 500,000 tons, which is equivalent to the entire world reserves of uranium. About 200,000 tons are found in the monazite beach sands of Kerala with a concentration of 9 per cent. The remaining 300,000 tons are found in the sands of Ranchi plateau in Bihar with a concentration of 10 per cent.

It would appear that, in comparison with its size and population, India's known conventional energy resources are inadequate. It is believed that, in due course, nuclear energy resources may have to be harnessed in a big way. The technical feasibility of harnessing nuclear energy for electric power generation has been proved; it is reasonable to expect that the economics of nuclear power also will become comparable with conventionally generated power.

Pattern of future development

According to the constitution of India, "electricity" is a concurrent subject, i.e. the Federal or Union Government as well as the State Governments can undertake legislation on this subject. At present, there are two major pieces of legislation on the subject both enacted by the Central Government and in both of which the States have major responsibility for administration. The first one, the Indian Electricity Act 1910, provides the rules and procedure for the issue of electric licences and takes care of questions relating to safety etc. The second, the Electricity (Supply) Act 1948, deals with matters concerning rapid and rational development of electric power. This provides for the establishment of (*a*) a Central Electricity Authority to develop a sound, national and uniform power policy and to co-ordinate the electric power development in the country as a whole, and (*b*) semi-autonomous State Electricity Boards to undertake electric power projects within the respective States and to arrange the supply of electricity to the

general public. This legislation also seeks to regulate the relationship between the State Electricity Boards and private licensees.

Until now, the programme of power plans has been related to the resources and requirements of individual States in the country. However, this is no longer practicable, as the natural resources of the country are not evenly distributed over the various political divisions of the States. The comparatively small scale of development in the past enabled each State to act independently, but with the present large magnitude of the power requirement and the substantial increase in the demand anticipated in the future, it is not appropriate from national considerations to continue with the present pattern of isolated development. The development of economically utilizable power resources in the potentially rich regions of the country has to be accelerated to take care of the requirements of the less richly endowed neighbouring areas. Large-scale inter-State transfers of power have to be planned. Future power development must therefore be planned first on a national basis, this plan being later broken up into appropriate parts to be allotted to individual States.

The above approach to power development implies that the transmission systems in the neighbouring States should be interconnected and the more economical sites for power generation should be developed first, irrespective of their location with respect to State boundaries. The interconnection of transmission systems of neighbouring States ensures the co-ordinated operation of hydro and thermal plants resulting in optimum utilization of power resources, reduction in the spinning and standby generating capacity for the region as a whole, and reduction in system peak demand due to diversity between the peaks in the different parts of the region. System interconnections are of great importance, as it is possible by this means to create additional load carrying capacity in a much shorter time and at much less cost than by establishing new generating stations.

In order to put this idea of regional power development into practice in India, certain administrative measures are contemplated. It is proposed to form regional boards for each of the different regions which will be responsible for making transmission line interconnections between the State networks and regulating the energy generation and dispatch at various interconnected power plants, so as to ensure the maximum over-all economy.

INDONESIA

Present status of electricity supply

Indonesia nationalized its public electric supply industry in 1957. The management is now vested in an organization called Perusahaan Listrik Negara (PLN) or State Electricity Enterprise, under the Department of Public Works and Energy. For the purposes of administration, the PLN has 13 divisions known as Exploitasi I to Exploitasi XIII; Exploitasi I to XII deal with the power supply in their respective geographical areas. Exploitasi XIII, however, is chiefly concerned with major generation and transmission and at the moment provides bulk power supply to Exploitasi XI and XII.

Indonesia is made up of a large number of islands spread over a length of 3,000 miles or more. Of these islands, the island of Java, though not the biggest, has the largest population. In regard to electricity supply, Java is naturally better developed than the other islands, having about 77 per cent of the total generating capacity in the country. The island of Sumatra has 13 per cent of the generating capacity, the balance of 10 per cent being distributed in all the other islands.

In recent years, owing to various reasons, such as difficulties of communication, reorganization of the supply industry and administrative changes, it has not been possible to obtain correct and complete data on the working of the electricity supply industry in Indonesia. It is believed, therefore, that the figures for generating capacity and energy generation, etc., included in the tables in this publication, are somewhat incomplete. However, according to the available data for 1962, the total installed generating capacity was 358.4 MW, comprising 45.8 MW steam, 170.9 MW hydro and 141.7 MW diesel stations. The total generation by the public utility stations in 1962 was 1,242 million kWh. The predominance of diesel generating capacity is a point of significance. As diesel plants can be installed and commissioned in a relatively short period of time and as it is possible to procure the necessary fuel oil from indigenous sources, substantial additions to the diesel generating capacity have been made in recent years to meet the increasing demands for power, particularly in cities such as Djakarta. These are necessarily short-term schemes, pending the construction of other major hydro-electric and thermal power stations.

The transmission networks are not uniformly spread throughout the country. They exist chiefly in Java, Sumatra and Sulavesi, those in Java being relatively better developed. The highest transmission voltage now in use is 70 kV, the lower voltages being 30 kV, 25 kV, 15 kV etc. The construction of transmission lines at 154 kV in connection with the Djatiluhur project is now in progress. By and large, most power plants are used to meet the power requirements of local areas, and an integrated and interconnected grid system has not yet developed to a significant extent.

Future development programme

Indonesia has a large hydro-electric power potential, but no comprehensive assessment of the water power potential has been made. However, according to the investigations made some time ago, the estimated hydro potential was of the order of 2,860,000 kW. The

Government has for some time been anxious to develop water resources for power production, although the progress has not been as fast as anticipated.

The Djatiluhur project will be the largest hydro-electric installation in the country. It is a multi-purpose project with provision for:

(*a*) Prevention of flooding caused by the Tjitarum river over Krawang and its surroundings.

(*b*) Irrigation of an 80,000 ha area which would make possible two-crop cultivation in each year instead of the usual one-crop cultivation.

(*c*) Electric power generation. Ultimately the power plant will be equipped with 5 turbo-generator sets of 25,000 kW each. This scheme is scheduled to be wholly completed in 1965, but the first and second units will be commissioned early in April 1964.

(*d*) Fresh-water fishery.

(*e*) Tourism/recreation.

The site of the project is on the Tjitarum river in western Java, about 6 kilometres from the town of Purvakarta. The project involves the construction of a storage reservoir with a capacity of about 83,300 million cubic feet. The dam will be of the rock fill type, with a height of 300 feet and a length of 3,000 feet. An unprecedented feature of this project is that the intakes, the spillway and the power units are all housed in a giant circular concrete tower 333 feet high and of 315 feet outside diameter, which is embedded in the rock fill dam. Flood waters will be discharged from the periphery of the tower, and will be led to the river through underground galleries. Six 25 MW power units will be placed peripherally inside the tower, water being drawn from intake openings through the tower wall and discharged via the spillway discharge tunnel into the river. This extraordinary design was used to ensure economy in construction costs, having regard to the poor foundations at the site. The estimated total cost is $100 million plus 600 million rupiahs.

As shown in table 15, the development programme over the next few years provides for 435,000 kW of steam power plants, about 415,000 kW of hydro plants and about 140,000 kW of gas turbine and diesel power plants.

It was expected that, during 1963, the steam power station (50,000 kW) at Perak, Surabaya plus about 15,500 kW of diesel power plants at various centres would be commissioned. Among the major projects expected to be commissioned in 1964 are (*a*) first two units (total 50 MW) of the Djatiluhur hydro-electric scheme, (*b*) second unit (25 MW) of the Tandjung Priok (Djakarta) steam power station and (*c*) about 5,000 kW of diesel power plants. Other projects are:

(1) Karangkates hydro-power project, East Java, with a capacity of 60,000 kW. Preparatory work has been commenced.

(2) Asahan hydro power project, North Sumatra, with 120,000 kW initial capacity. At the second stage it is to be increased to 280,000 kW. This project is under investigation.

Work is also in progress on Batang Agan hydro power plant (West Sumatra), Riam Kanan hydro power plant (Kalimantan), Tonsea Lama hydro power plant (North Sulawesi) and diesel electrification projects in various parts of Indonesia.

The electric energy sold by the public utilities has been utilized mainly for households; only a small portion (20 per cent) has been used by industries. Some large industries, particularly the oil industry, own and operate power plants for their own use. In some cases, those industries also sell power in bulk to the utilities for redistribution to general consumers.

IRAN

Establishment of Iranian Electric Authority

Iran has large petroleum and natural gas resources, which could be utilized, apart from chemical purposes, for the production of electricity. There are also some sizeable hydro-electric sites which could be developed, but so far these resources have largely remained undeveloped.

In the past, electricity supply in Iran grew up in a hapahazard way. Municipalities and private companies established power plants for supply to the domestic consumers. Normally, industries established their own power plants and in some cases these industrial power stations sold their surplus power to the domestic consumers in the neighbourhood. In the absence of proper control and regulation of the electricity supply business, and owing to the lack of organized development, the conditions of electricity supply were very unsatisfactory. Supply was unreliable, voltage conditions were very poor, lines and installations were far from safe, and apart from tariff rates being high, the consumers were required to contribute exorbitant sums as initial connection charges. Distribution facilities were poor. The supply in many areas was confined to certain hours of the night or certain nights of the week. As there was no government control, more than one company commenced operation in the same area. In Teheran city alone, it was reported that there were thirty companies supplying electricity.

The Plan Organization of Iran recognizes the importance of providing ample supplies of electricity at economic rates as a basic necessity for economic development. The third development plan, which commenced in November 1962, has accorded the highest priority to

this question. Prior to the formulation of the plan, the Plan Organization set up an Electricity Plan Committee in 1960 to make a thorough investigation of all essential factors connected with the electricity supply industry and to work out a practical power programme for the third plan. The terms of reference of the Committee also included questions relating to the organization, regulation and control of the electricity supply industry. Apart from working out the broad details of electric power development in the third plan, the Electricity Plan Committee recommended that urgent attention should be paid to organization, control and regulation of the industry. The Committee suggested that a central agency should be established to promote, guide and regulate, on a rational and sound basis, the rapid development of electric power in the country. These recommendations were accepted by the Plan Organization and the Government, and the Iranian Electric Authority was established in January 1963.

The Authority is composed of the High Electricity Council and the Managing Director. The Council is made up of the Managing Director of the Plan Organization as the chairman, and four members including the Under-Secretary to the Ministry of Industries and Mines and the Under-Secretary to the Ministry of Interior. The High Electricity Council is required to establish, review and interpret the policies of the Authority. The Managing Director of the Authority, who is appointed on the recommendation of the chairman of the High Electricity Council, is required to report to the Council on matters connected with the organization, budget and annual report and other substantive matters pertaining to the functions of the Authority.

The law under which the Iran Electric Authority was established states that the Authority shall be the sole agency authorized to issue licences for the establishment of generating, transmitting and distributing facilities and for the supply of electrical energy. It provides that every person or organization desiring to undertake the sale of electrical energy shall apply to and obtain from the Authority an appropriate licence. All existing electrical undertakings are also required to apply and obtain a valid licence from the Authority. Government agencies intending to install or expand existing electric power plants for the supply of power required by industries under their supervision are also required to secure the previous approval of the Authority. In other words, the Authority is made responsible for the over-all planning of power development in the country.

Provision has been made to issue licences to what are known as 'area electric utilities', authorized to distribute electric power supply to the ultimate consumers within a given area. Also, regional electric utilities may be licensed to establish generation and transmission facilities for the bulk sale of electrical energy to the area electric utilities.

The Authority is empowered to exercise appropriate control over the licensees activities, and in particular, to approve their tariff schedules.

The Authority is required to work out programmes for the extension and improvement of electricity generation and distribution in the country, having regard to the objectives of the third and subsequent national economic development plans.

The Authority may provide financial assistance to the extent possible to the area and regional electrical utilities by advancing loans for development purposes. Also the Authority may render technical assistance and service to the utilities, in which case an appropriate fee may be charged.

The Authority is empowered by law to collect from the area and regional electric utilities and all other organizations connected with generation, transmission and distribution, all information and statistical data considered essential for an economic assessment of the various aspects of the electric power supply industry and for sound planning of future development programmmes.

Present status of electric power supply

At present, the statistical data available on the electricity supply industry in the country are by no means complete or reliable. According to the available information, however, the total installed capacity of electric power plants in Iran rose from 275 MW in 1960-61 to 490 MW in 1962-63. During the same period, the generation increased from 860 million kWh to 1,000 million kWh. The most important load centre in the country is the Teheran area, where thermal power plants with an aggregate capacity of about 74 MW are in service. The Teheran power system is interconnected with the Karadj dam hydro-electric power station (65 km from Teheran), which has an installed capacity of 75 MW. The Karadj project is primarily intended to provide municipal water supply in Teheran; the discharge is so regulated as to be able to meet the peak load demands in Teheran. Various proposals for augmenting the supply capacity of the Teheran power system are under consideration, among them being the question of utilizing the natural gas discovered at Qum for the generation of electric power by means of thermal stations at suitable locations.

Recently, a 100 metre high dam has been built on the Sefid Rud river at Mandjill (240 km from Teheran) together with a power plant consisting of five units, each of 17.5 MW. Work is in progress on the construction of transmission lines towards the north to Rasht, Pahlavi and other centres along the southern coast of the Caspian sea. It is also likely that the Sefid Rud station will be interconnected with the Teheran power system.

By far the most important development is taking place in the Khuzestan region of Iran. The long-range

programme for the development of the Khuzestan valley includes the construction of about 14 dams on the five rivers flowing in the region and the construction of power stations, transmission lines, irrigation systems, etc. The first step in this long-range programme is the Dez dam project, designed to provide power, irrigation and flood control in the region. Of the electrical works (cost estimated at $88 million) included in the initial stage programme, those now in progress are: (*a*) a 190 metre high thin arch concrete dam impounding a reservoir with a capacity of 3,300 million cubic metres, and (*b*) a hydro-electric power station with an initial capacity of 130,000 kW (2 units), and an ultimate capacity of 520,000 kW, as well as 230 kV transmission lines connecting the power plant to various centres such as Ahwaz, Dezful and Andimesk.

The dam, the power station and the transmission lines were commissioned early in 1963. A few years earlier, the 132 kV line between Abadan and Ahwaz had been built and commissioned for transmitting temporarily power purchased in bulk from the Abadan oil refinery power station for distribution in the city of Ahwaz.

The Khuzestan Development Services have also undertaken a reorganization of the existing utilities and supply systems in the region. For this purpose, a subsidiary company, known as the Khuzestan Electric and Gas Company (KEA) has been established. On completion of the Dez dam project, the power production and transmission facilities of the project will be owned and operated by this company, which has been given broad powers and responsibilities as regards power development throughout Khuzestan. These include promoting the widespread use of electricity, providing electricity supply at prudent promotional rates, promoting the use of now-wasted natural gas, and constructing and operating thermal and hydro generating facilities. The KEA will arrange for the supply of electric energy in bulk to agencies for retail distribution to various categories of consumers.

In order to reorganize the Ahwaz city distribution scheme, a private corporation, owned by the municipality of Ahwaz and called the Ahwaz Electric and Gas Company, has been established. This company is modelled on the lines of municipal power companies in the United States. It has a board of directors composed of leading citizens, which is responsible for general administrative policy. Technical policies to be followed by the company are suggested by the KEA under a management agreement between the company and the KEA. The KEA provides management training, introduces new accounting procedures, etc. The Company has adopted a modern customers' accounting programme that provides complete internal control. It has a sliding scale of rates which decrease as more power is used. The remarkable progress and improvement recorded by the Ahwaz Electric Company can be judged from the fact that the annual consumption of energy in the city rose from 4.8 million kWh to 15 million kWh during its first year of operation. At the same time, the Ahwaz Electric Company has undertaken the rehabilitation of the distribution system in the city of Ahwaz.

The rehabilitation of the distribution systems in other cities such as Abadan, Khorramshahr, Dezful and Andimesk are also being pursued by the KEA. The systematic methods and procedures as well as the organizational efficiency of the KEA have greatly contributed to the success of the power development programme in the Khuzestan area. The experience in this region will undoubtedly be of much value for promoting power development in other regions as well.

Among other important areas where there has been some measure of power development are Isphahan and Shiraz. Local stations (steam power plants or diesel plants) are the source of power supply in all these places. In the course of the second development plan, the Plan Organization had sanctioned a scheme to assist municipalities in providing electric power supply facilities. The Plan Organization offered a subsidy of 50 per cent towards the initial cost of power stations and distribution systems designed to serve municipal areas. It was originally proposed to include 181 municipalities under this scheme, but, for various reasons, the figure was subsequently reduced to about 160.

In many of the cases in which the municipalities were unable to finance their own share of the cost, the Plan Organization financed the whole scheme by providing 50 per cent as a subsidy and 50 per cent as a loan. Under this scheme, the Plan Organization expected to create about 40 MW of additional generating capacity widely distributed in the various areas of the country. The scheme was not completed by the end of the second plan period (September 1962), but it was decided to make financial provisions for the uncompleted works under this scheme in the third development plan now in progress. At the same time, it was decided not to start any new scheme of this nature in the third plan period.

For various reasons, the present conditions of supply in most of these municipal areas are unsatisfactory; the voltage regulation is poor, interruptions to supply are frequent, there is insufficient supply capacity available and also the charges are high. It is hoped that the rehabilitation and reconstruction to be undertaken by the Iran Electric Authority will help improve the working conditions of the industry.

The Electricity Plan Committee proposed that, under the third plan, the outlay on electric power projects should be of the order of 15,700 million Rials (US$207 million) to augment the generating capacity in the country by 532 MW and provide the necessary transmission and distribution facilities.

JAPAN

The electric utility industry in Japan is basically the responsibility of private enterprise; the Government, through the Ministry of International Trade and Industry, exercises over-all control and supervision in accordance with the provisions of the Public Utilities Ordinance and Electric Enterprise Law. Recently the need was apparently felt for a re-exammination of the existing statutory provisions, and for that purpose the Government appointed what is known as the Electric Utility Industry Deliberation Council. The Council is required to work out a guiding policy for the solution of the basic problems of the electricity supply industry and to draft appropriate legislation which will be of more permanent value.

During the fiscal year 1962, the installed generating capacity in Japan increased from 22,755 MW to 25,503 MW. During the same period, the self-generating industries augmented their generating capacity by about 400 MW. The total additions to the generating capacity during the year, viz. over 3 million kW, were the highest annual addition so far.

Despite 1962 having been a record year for additions to the capacity of the Japanese electricity supply industry, it was also characterized by a somewhat sudden reduction in the rate of growth of industrial production. As a result, the increase of energy generation and energy sales by the electricity supply industries recorded a fall. Since 1951, Japan has been passing through a period of economic resurgence with the index of industrial production increasing at 15 per cent per year. Commencing in the middle of 1961 and throughout the fiscal year 1962, however, it showed signs of slackening. Actually, in certain heavy industries such as iron and steel, chemicals and fertilizers, there was a slight reduction in the offtake of electrical energy. It is understood that this slackening was really temporary and was in the nature of a readjustment of the extraordinarily high growth rate in the preceding three years.

The decline in the rate of increase of electricity consumption by industries in 1962 did not, however, have any effect on the use of power for residential purposes. In fact, the residential consumption showed a record increase of over 20 per cent.

Severe drought conditions were experienced in Japan during 1962, which brought about a decrease in the energy availability in the hydro stations. Nevertheless, on account of the relative retardation in the increase of energy offtake by the industries, it was possible for the electricity utility industry to meet all the demands effectively.

The general pattern of the power development programme continued in 1962 as in recent years. There was a preponderance of thermal power plant construction, although a number of large and high dams together with power plants were built in the upper reaches of the various rivers. For the first time in history, the installed capacity as well as the generation by thermal power stations in Japan exceeded those of hydro stations. In fact, owing to the severe drought conditions in Japan in 1962, the generation by hydro stations was actually less than that in 1961.

The largest unit capacity of thermal power plants in operation at present is 265 MW operating at a pressure of 169 kg per sq cm and a temperature of 566°C. The design thermal efficiency of these machines is 40 per cent. The average over-all thermal efficiency of many of the recently built stations ranges between 35.22 per cent and 37.13 per cent.

The development of transmission lines has kept pace with the generation. The aggregate length of transmission lines belonging to the nine electric power companies and the Electric Power Development Co. amounted to over 6,000 km in the voltage range 187 kV to 275 kV. Lengths of lines of voltages 154 kV and 110 kV aggregated over 13,000 km and 4,700 km respectively. With the effective and willing co-operation of the nine regional power companies, the method of unified and integrated operation of power plants is being followed to secure the maximum economy. To ensure the effective coordination of the output of the various power plants, the country is divided into four regions in each of which a local office is set up to regulate the generation at individual plants as well as the interchange of energy between the various load centres. A central office in Tokyo undertakes the over-all supervision of the integrated system.

During the fiscal year 1962, (when a severe drought caused a reduction of output from the hydro stations), the total amount of energy interchanged between the power systems of the regional companies was 3,360 million kWh (nearly 3 per cent of the country's total output). It was also estimated that the method of integrated operation enabled the member companies save an expenditure of as much as a million dollars during 1962.

The existence of two frequencies of A.C. supply in Japan has been a major handicap. Interconnection between 50 and 60 cycles per second areas was effected in the past either through rotary frequency converters or by using generating units designed to operate at either 50 or at 60 cycles per second as desired. The total amount of energy which can be interchanged by these means is obviously limited. Recently, a project has been worked out to interconnect the power systems of the different frequencies through mercury are rectifiers and inverters. By interposing a mercury arc rectifier, the supply at one frequency is converted to D.C., then the D.C. output is inverted to A.C. again at a modified frequency. A scheme to transfer 300 MW of power in this manner from one system to another is now under construction at the Sakuma hydro-electric station.

As regards the financial aspects, it is well known that the costs of new construction have increased very substantially. It was estimated that, in Japan, the ratio of the costs of plants installed after 1954 to those in existence in that year was 3.0 for thermal plants and 2.39 for hydro plants. Also the costs of fuel for thermal plants and of operation and maintenance have increased. This naturally calls for a corresponding increase in the tariff rates for electricity supply. In order to regulate the rate increases on an equitable basis, the Government promulgated a ministerial ordinance in February 1960, which introduced the principle of fair return. According to this ordinance, the fair return was fixed at 8 per cent of the rate base which is defined as the true and effective value of the assets of the business. In accordance with this ordinance, three of the electric power companies, Kyushu, Tokyo and Tohoku, have raised their tariff rates.

The table below shows an analysis (in percentage) of energy sales and revenues classified according to the different categories of consumers. It will be seen that although industries consume 82 per cent of the total energy sold, they contribute only 64 per cent of the revenues, whereas residential consumers, who account for 17.7 per cent of energy consumption, contribute 36.0 per cent of revenues.

	Energy sales (per cent)	*Revenue (per cent)*	*Average revenue for kWh sold (Yen/kWh)*
Flat rate residential	0.7	1.2	9.60
Metered residential	17.0	34.8	12.01
Total residential	17.7	36.0	11.95
Power and lighting	4.0	5.4	8.03
Small industries	16.2	19.3	7.01
Large industries	59.7	37.3	3.67
Other power services	2.4	2.0	4.95
Total industrial service	82.3	64.0	4.58

KOREA, REPUBLIC OF

Present status of power supply

In 1960 and 1961, there was no addition to the installed capacity of the Korea Electric Company, which remained at 367.3 MW; the generation of electricity recorded a small increase from 1,699 million kWh in 1960 to 1,772 million kWh in 1961 (or 4.3 per cent). More substantial increases in installed capacity and energy generation were recorded in 1962 (434 MW for installed capacity and 1,978 million kWh for generation representing increases of 5.5 per cent and 11.6 per cent respectively). Among the new plants added in 1962 were the 30 MW power barge at Pusan harbour and two diesel stations at Wangsipri (18.8 MW) and Kwangju (11.8 MW). Apart from th production of the Korea Electric Company, which is a public utility undertaking, the capacity of power plants installed by self-generating industries amounted in 1962 to 119 MW, and these plants had an output of 198 million kWh.

Thermal power accounted for 66.8 per cent of the capacity and 64.5 per cent of the generation in 1962.

High voltage transmission networks comprising 1,060 km of 154 kV lines and 2,600 km of 66 kV lines connect the existing power plants to various load centres. An excellent network of 22 kV lines has also been developed in several regions.

Consumption of electricity by industries absorbs over 71 per cent of the energy sold by the Korea Electric Company. Domestic consumption accounts for about 17 per cent. High voltage distribution lines at 6.6 kV, 5.7 kV and 3.3 kV are in use to step down the voltage of supply to the consumers at either 3-phase 3-wire 200 V or single-phase 2-wire 100 V.

Projects under construction and under consideration

The Korea Electric Company has on hand a heavy programme of construction comprising thermal and hydro generating stations as well as transmission and distribution systems. It is estimated that the country's hydro-electric power potential is about 1,682 MW; the plants now in operation have a total capacity of only 143.5 MW, and two plants with a capacity of 72.0 MW are under construction. It will be seen, therefore, that there is much scope for further development of hydro-electric power in the country.

Hydro-electric projects usually take a long time for execution, however, and meanwhile it becomes necessary to build thermal power stations to meet the ever-increasing demands for power. The Korea Electric Company has on hand the construction of several thermal projects with an aggregate capacity of about 510 MW.

Salient particulars of some of the projects under construction or consideration are as follows:—

Sumjinkang hydro-electric project provides for the addition of a second generating unit (14,400 kW) as well as completion of the dam and other civil engineering works, which were discontinued after the Second World War. When the present works are completed by the end of 1964, this project will have a total generating capacity of 28,800 kW (including the first machine already installed).

Chunchon hydro-electric project on the Han river is located downstream from the existing Hwachon hydro station. This station will have a capacity of 57,600 kW (two machines) and is expected to have an annual energy output of 145 million kWh. On completion, the regulated discharge from this station will also help to increase the output of the Chongpyong station located further downstream on the same river.

The design and engineering work on this project has been undertaken entirely by Korean engineers. The estimated cost of the project is US$20.5 million of which the foreign exchange component is only US$4.1 million or 25 per cent.

The *Chongpyong hydro station* (40 MW), downstream from the Chunchon project and about 55 km north-east of Seoul, was completed and first commissioned during the Second World War. The dam and the power station have since suffered much damage as a result of erosion, and urgent rehabilitation measures are now in hand. The estimated cost of the rehabilitation is US$7.84 million.

Soyang hydro-electric project with two units each of 45 MW, estimated to cost US$40 million, is under consideration and construction work is expected to be commenced in 1964. The project is located 12 km upstream from Chunchon city at the confluence of the Soyang river with North Han river. This project will not only provide power benefits, but also help irrigation and flood control.

The *Weeam hydro-electric project* (two 17,300 kW units) is located on the North Han river between the Chunchon and Chonpyong stations. The energy output of the station is expected to be 141 million kWh. The project, now under construction, is expected to be commissioned by the end of 1965.

Another major project now under consideration is the *Chunchu hydro-electric scheme* on the south Han river. The proposed capacity of the plant is 150 MW (three units of 50 MW) and the total energy output 519 million kWh. The estimated cost of the project including the associated transmission lines is US$60.9 million and, subject to the administrative and financial arrangements being settled, the execution of the project will be taken up in 1966.

The old *Yongwol thermal plant* built by the Japanese during the Second World War with four units each of 25 MW deteriorated by age and suffered war damages with the result that its useful capacity was reduced to 47 MW. This plant was rehabilitated recently at an expense of US$7.7 million bringing its capacity to about 80 MW. Also a new Yongwol thermal plant comprising two 50 MW generating units costing US$24.7 million is expected to be commisisoned by the end of 1964. This station will operate at 1,250 psig pressure and 950°F temperature. Korean anthracite coal (low calorific value of about 3,500 kcal/kg) supplemented by fuel oil will be the fuel for the power plant.

The *Samchok no. 2 thermal plant* (30 MW), located by the side of the no. 1 plant (25 MW), will also use Korean anthracite coal supplemented by fuel oil. Proximity to the coal field and the scope for industrial development in the neighbourhood are factors which influenced the choice of location. The estimated cost of the project is US$8.7 million.

Pusan thermal plant, planned for installation on the outskirts of Pusan city, will have two turbine generators each of 66,000 kW capacity and two boilers of 565,000 lb/h steaming capacity, (950°F temp. and 1,250 psig pressure) and will burn Korean anthracite coal supplemented by fuel oil. The project, estimated to cost US$30.9 million, is being carried out with the help of a loan from the United States AID.

Another thermal project expected to be completed with the assistance of the United States AID by the end of 1965 is the *Kunsan city thermal project,* with an installed capacity of 66 MW. This project is estimated to cost US$18.8 million. Later it is proposed to add another 66 MW capacity at this plant.

Also, at the outskirts of Seoul, the *Tanginri thermal power station* is being extended by the addition of two new 66 MW generating sets at a cost of US$32.9 million.

Simultaneously with the programme of augmenting the generating capacity, steps are also being taken to provide adequate transmission and distribution facilities. Among the more important transmission projects are: (*a*) the Iri project—63 km of 154 kV lines, 36,000 kVA capacity of transformer substations, (*b*) the Yangji project—164 km of 154 kV and 26 km of 66 kV lines, 60,000 kVA of transformer capacity, (*c*) the Chonan 154 kV substation—capacity 30,000 kVA and (*d*) a network of 22 kV lines in several areas.

The present primary distribution voltage is largely at 3.3 kV. With the increase in demand for power supply in all areas, this has proved to be too low. As a step towards improvement of the present situation, the distribution voltage is being raised from 3.3 kV delta to 5.7 kV star, so that while the lines will be operated at a higher voltage, it will be possible to use the same distribution transformers. While this will be a tentative solution of the problem of low distribution voltages, an over-all reorganization of the system would be very useful.

LAOS

Electricité du Laos is the sole public utility responsible for electric power supply throughout the country. The existing power plants are all small in size and are powered by diesel engines. For the country as a whole, the installed generating capacity rose slightly from 3.6 MW in 1959 to 3.8 MW in 1960 and further to 4.6 MW in 1961. There was no addition in 1962. The generation of electrical energy has been steadily on the increase; it rose at an annual rate of about 16 to 19 per cent from 5.8 million kWh in 1959 to 9.4 million kWh in 1962.

Electricity is used mainly by households, and commercial and business sectors; the few existing industries run their own power plants. Even under the present conditions of limited scope for the utilization of electricity it is reported that a power shortage is experienced everywhere.

The largest station, which is in Vientiane, is equipped with diesel generating units with a combined

installed capacity of 3,432 kW. Power plants at other towns have installed capacities of 500 kW or less. Twenty-four hour supply is maintained only in Vientiane and two large towns, viz. Savannakhet and Paksé. In all the other towns, the power supply is available for 15 hours a day from 5 p.m. to 8 a.m. only. The voltage of electric supply to consumers is 380/220V, 3-phase 4-wire in some towns, and 220/127V, 3-phase 4-wire in the others. In Vientiane, 6.6 kV is used as the primary distribution voltage. The frequency of A.C. electricity supply is 50 cycles per second throughout the country.

Measures are on hand at present for the expansion of power supply in large load centres. It is understood that at Vientiane three 1,000 kW diesel sets are being installed. The total cost of this installation is estimated at US$789,010, of which US$665,883 will be financed by Japanese aid. Consideration is also being given to the installation of a further 1,000 kW unit.

Laos is one of the riparian countries participating in the international project for the development of the lower Mekong basin. Investigations are in progress on the Nam Ngum, a tributary of the Mekong river, for a multi-purpose project which will ultimately have an installed capacity of 120,000 kW.

MALAYSIA

Former Federation of Malaya

An event of special significance during 1963 was the inauguration on 26 June of the first major hydro-electric scheme of Malaysia at the Cameron Highlands in Perak State. The scheme involves the diversion of the Telom and Bertram rivers, which normally flow towards the east coast, by means of tunnels to join the Batang Padang river on the west. The first stage of the project now completed includes the small Habu power station (5,500 kW) to utilize the drop available between two lengths of tunnels and also the main Jor power station with four units of 25 MW each.

Transmission lines at 132 kV have been built to connect the hydro-electric power station with Kuala Lumpur and the Connaught Bridge thermal power station. The high incidence of lightning in this region called for special design features to be incorporated:

(1) Duplicate overhead ground wires vertically above the conductors in the case of double circuit lines and with a shielding angle of 23° to the outer conductors in the case of single circuit lines.

(2) The use of treated wooden cross arms on all lines to increase the impulse flash over voltage of the line insulation.

(3) Buried counterpoise earthing or deep driven rods to reduce tower footing resistances to about 10 ohms.

(4) Provision of carrier actuated distance protection with automatic high speed three-phase reclosing facility.

In the State of Johore, a new 30 MW thermal power station has been recently commissioned. Formerly, Johore Bahru, the chief city of Johore State, was connected to Singapore by means of 22 kV lines. With the commissioning of this new station, industrial development in the State of Johore is expected to receive special encouragement. It is planned in due course to extend this station to an ultimate capacity of 150 MW and also to interconnect this system with the Central Electricity Board's existing transmission network connecting the Cameron Highlands hydro-electric project and the Connaught Bridge thermal project.

The total capacity of the public utility power plants in the area of the former Federation of Malaya remained more or less stationary during the period 1960 to 1962, but the energy generation increased from 1,085.9 million kWh during 1960 to 1,238.5 million kWh in 1961 and 1,366.7 million kWh in 1962, the annual rate of increase being 13.4 and 16.9 per cent respectively. The Central Electricity Board and the Perak Hydroelectric Co. accounted for more than 90 per cent of the total generation and supply. As regards the pattern of consumption, industries consumed 61 per cent of the total energy sold domestic and commercial consumers taking 11.3 and 16.9 per cent respectively.

North Borneo (Sabah)

The North Borneo Electricity Board, established in 1957 with the object of promoting electric power development in the State, has been making steady progress; at the end of 1962, the total installed capacity of the power plants in the state amounted to 9.2 MW, all diesel engine driven. The Board had power stations at all the important centres; the capacity of these plants was less than 1,000 kW except in the case of Jesselton, Sandakan and Labuan. Electricity is used mainly for domestic and shop lighting purposes and the population is very scattered, which explains to some extent the small capacity of most of the existing power plants.

As in most other countries, the rate of growth of electricity generation in North Borneo is high. Between 1960 and 1962, the annual energy generation increased from 15.0 million kWh to 22.9 million kWh, the annual percentage increase being about 23 to 24 per cent.

In all probability, considering the large rivers and the hilly terrain, the total hydro-electric power potential of North Borneo is very large indeed. A survey of the hydro-electric power potential was recently carried out by an Australian expert under the Colombo plan. It is understood that there are several sites on the east-flowing rivers where large power outputs of the order of 300,000 kW are feasible. On the west coast also,

the power potential is substantial, and the west-flowing streams are short and have relatively large hydraulic drops. Water power sites of large capacity such as 300,000 kW may not be of immediate interest, because at the present time such large blocks of energy cannot be absorbed. In the near future, it will probably be desirable to concentrate on small schemes able to meet the needs of local regions.

Sarawak

The government-owned Sarawak Electric Supply Company was dissolved with effect from 31 December 1962 and its assets etc. were vested in the newly established Sarawak Electric Supply Corporation. This reorganization took place in accordance with the terms of the Sarawak Electricity Supply Corporation Ordinance enacted by the Sarawak legislature on 21 December 1963. The Corporation is in th nature of a statutory authority with the responsibility for promoting the generating and supply of electricity in order to further the economic development of the state.

All the installations of the Sarawak Electricity Supply Corporation comprise diesel engine power plants. Although in absolute terms, the present capacity of electric supplies is still small, the rate of development of the Corporation has been very substantial during recent years. Electricity consumption has been growing at the rate of 18.5 per cent per year, i.e. doubling approximately every four years. The number of consumers is growing at the rate of over 14 per cent per year.

Apart from the Sarawak Electricity Supply Corporation (installed capacity 11,310 kW), private licensees, government establishments and the oil industry at Miri had a total installed generating capacity of 8,096 kW at the end of 1962 (The oil industry alone had an output of 17,309,230 kWh in 1962 and it is estimated that the rest of the undertakings generated about 2.8 million kWh.)

Sarawak has undoubted potentialities for hydro-electric power development. Under the Colombo Plan, Australia provided the services of an experienced engineer to advise on the collection of necessary data for the assessment of the hydro-electric possibilities. The preliminary studies showed that Sarawak has a theoretical potential of 192,000 million kWh per year and even on the assumption that the economic potential will be only 20 per cent thereof, it will still be nearly 1,000 times the present generation! It is understood that, as a first step, possible sites for hydro-electric development are being identified and selected for detailed investigations.

Singapore

Between 1960 and 1962, there was an addition of 25 MW to the generating capacity of the power plants in Singapore, which comprised the Pasir Panjang station (177.0 MW) and the St. James station (36 MW). The Pasir Panjang station has seven units of 25 MW each and a 2 MW open cycle gas turbine. The St. James power station has six sets of free piston gas engine sets each having a capacity of 6 MW. Owing to various technical difficulties, it is reported that this station has not been running for a good part of the time.

The growth of demand for power has been steady. Special efforts are being made by the Government to encourage industries by developing the Jurong industrial estate and providing essential facilities to attract prospective industries. A 66 kV underground cable has been laid from the Pasir Panjang station to Jurong, together with a 66/22 kV substation and other switching facilities. A steel plant with arc furnaces has commenced taking supply, and it is expected that many more industries will soon be established, calling for large blocks of power.

To meet the anticipated increase in the demand for power, particularly from the new industries in Jurong etc., steps are being taken to build a new thermal power station by the side of the existing Pasir Panjang station. The new station will initially have two units each of 60 MW capacity operating at a pressure of about 1,400 lb per sq in. It is understood that the International Bank for Reconstruction and Development has advanced a loan to finance the foreign exchange cost of this project.

The new plant will not be available before 1965, however, and meanwhile the demand for power has grown beyond the capacity of the Pasir Panjang station. To meet this emergency, two gas turbine units each of 11 MW are being installed at Jurong industrial estate. These units will take care of the growing power demand in the immediate future, and will be used as peaking plants at a later stage.

NEPAL

At present, power supply is available only at Kathmandu, the capital city, (with its neighbouring townships of Patan and Bakthapur), Birganj and Biratnagar. There is an acute shortage of power in all these places, and the situation will remain so until some of the large projects are brought into service. To relieve the situation on a short-term basis, two diesel power stations each of 500 kW capacity were installed and put into operation in 1962 in Kathmandu valley. The existing radial distribution system in the Kathmandu valley, where the energy consumption is nearly 80 per cent of the country's total consumption, is very old and inadequate. Efforts are being made to replace the old system by a new 11 kV ring main and 3.3 kV sub-distribution system. All materials and equipment necessary for this purpose were procured in 1962.

For historical reasons, Kathmandu has two frequencies of A.C. supply at present, 60 cycles per second at the very old hydro plants and 50 cycles per second at the recently built diesel stations. It has been decided that all new power stations will be designed on 50 cycles per second frequency. The 60 cps plants are expected to be shut down in due course.

The two new diesel stations which were completed in 1962 in Kathmandu raised the total installed capacity of the country to 7,316 kW, made up of 3,400 kW of old hydro plants and 3,916 kW of diesel plants. The aggregate electricity output of the country as a whole in that year amounted to 12.6 million kWh, representing a 15 per cent increase over the output in 1961. The electricity consumers in the past were mainly those in the domestic and commercial sectors.

Power demand in the country is advancing year by year. Small and medium size industries are growing rapidly and foreign entrepreneurs are showing interest in industries. It is expected, therefore, that the demand for power in the next few years will be tremendous. To cope with the immediate needs, a 4,410 kW diesel power plant at Hetanda and a 1,470 kW diesel set at Kathmandu are being installed. These stations are to be commissioned by the end of 1964.

In the meantime, measures are being taken for hydro-electric development. The hydro-electric potential in Nepal is tremendous. No systematic assessment had been completely carried out, but a rough estimate shows that the hydro potential of major and medium rivers amounts to approximately 20,000,000 kW at 60 per cent load factor. Hydrological and hydrographical stations are being set up along streams to collect water data. This scheme will be expanded through the coming years until the whole country is well covered. Hydro-electric surveys are being carried out on a few main rivers and construction works are proceeding on two rivers. With the help of the United Nations Special Fund, a comprehensive survey of the Karnali river basin is in hand. Among the hydro-electric projects now under construction are the station on Trisuli river (9,000 kW) and the Panauti station (2,400 kW). These are expected to be completed by 1965.

A 66 kV transmission line from Trisuli to Kathmandu is under construction. A similar line will be constructed during the country's three-year plan from Bhaise to Simra (25 miles). Ultimately, this latter line will be extended so as to connect Trisuli to Birganj (about 80 miles).

With regard to rural electrification, it is proposed to install micro hydro stations in rural areas. Planning of this scheme is under way.

NEW ZEALAND

Introduction

New Zealand comprise four main islands plus a number of smaller islands with a total area of 103,736 sq miles. The administrative boundaries of New Zealand, exclusive of island territories extend from latitude 33° to 53° south and from longitude 162° to 173° east. The combined length of the North and South Islands is just over 1,000 miles and neither exceeds a width of 280 miles. The country is relatively mountainous, only one sixth of the area lying beneath the 600 ft contour.

New Zealand is subject to severe earthquakes, particularly in the south of the North Island and the northern portion of the South Island. There is considerable volcanic activity in the centre of the North Island.

New Zealand has a population of about 2,500,000 including some 170,000 Maoris. By comparison with many countries, New Zealand has a low population density—almost 24 persons per square mile.

As the main islands are situated between latitudes 34° and 47° South, New Zealand is wholly within the temperate zone. The mean annual rainfall ranges from as little as 13 inches in the small area of central Otago to over 300 inches in the southern Alps. For the greater part of the country, the rainfall is between 25 and 60 inches.

Mean temperatures at sea level decrease steadily southwards from 59°F in the far north to 54°F near Cook Strait then to 49°F in the south. January and February, with approximately the same mean temperature, are the warmest months of the year; July is the coldest month.

Organization of electricity supply

The production and sale of electricity in New Zealand is a combined government and local effort. The government authority, the New Zealand Electricity Department, is responsible for the construction, operation and maintenance of all plant necessary to generate, transmit and deliver power for sale in bulk to local authorities, which handle the distribution to retail consumers.

The New Zealand Electricity Department, headed by the Minister of Electricity, operates and maintains the national grid of electric generating and transmission facilities. Including a few generating plants operated independently by local authorities, the installed generating capacity at 31 March 1963 was approximately 1950 MW with a system peak of slightly more than

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1650 MW. The Department is also responsible for the installation of plant at power stations and the construction of the transmission system.

The Works Department, headed by the Minister of Works, carries out the civil engineering work. The two ministerial posts are held by the same individual and the two departments are represented on the committee which, under the chairmanship of the general manager of the Electricity Department, is responsible for planning.

The electric supply system is integrated in each of the two islands and will be completely integrated nationally after installation of a submarine cable across Cook Strait. The cable is to be in service by April 1965.

Electricity distribution is in the hands of 83 licensed local supply authorities, which buy their requirements directly or indirectly from the New Zealand Electricity Department (except for a small amount of local generation). Supply authorities are elected autonomous local bodies each with the right to control its own affairs. Local tariffs, while varying among the authorities as to level and form, generally provide lowest rates for domestic consumers.

Load forecasting and system planning

The New Zealand Electricity Department has the assistance of two separate committees, the Committee to Review Power Requirements and the Planning Committee on Electric Power Development in New Zealand, to study annually the estimated future electricity requirements and the facilities required to supply these requirements, respectively. Both committees are under the chairmanship of the general manager of the Electricity Department, and their reports are presented annually to Parliament.

Initial five-year forecasts of consumption and demand prepared by each of the 83 electricity supply authorities are collated by a central committee known as the Power and Finance Utilization Committee. The results are reviewed, modified as necessary, and extended for a second five-year period by the Committee to Review Power Requirements, which consists of representatives from the New Zealand Electricity Department and local supply authorities, and the Government Statistician.

The Planning Committee on Electric Power Development is required to draw up a plan of development to meet the estimate of demand as determined by the Committee to Review Power Requirements. The New Zealand Electricity and Works Departments, the Treasury, and the local electrical supply authorities are represented on the Planning Committee.

An Electricity Advisory Council of three persons not employed in the Public Service was set up by legislation passed in 1962 to carry out the following functions:

(*a*) To report to the Minister from time to time on the progress achieved in providing means for the generation of electricity, to the extent that the amount of any such generation has been determined by the New Zealand Government, and in providing means for the distribution of that electricity;

(*b*) To make recommendations to the Minister from time to time relating to the measures that should, in its opinion, be taken to ensure:—

(*i*) The best and most economical means of maintaining and co-ordinating the generation and the supply of electricity;

(*ii*) A simplified and equitable method of charging for electricity so as to avoid wide variations in charges for comparable types of supply;

(*iii*) The effective co-ordination of the distribution systems of supply authorities and of the areas of supply of any such authorities;

(*iv*) The promotion of safety and training in all branches of the electrical industry and in the use of electricity and electrical equipment;

(*c*) To make reports and recommendations to the Minister in respect of such other matters as may from time to time be referred to it by the Minister.

Present status of the electricity supply industry

(*a*) *Generation*

(*i*) *Natural fuel resources*

Coal. The coal resources of New Zealand have been estimated at 1,108,185,000 tons, including proved and estimated reserves.

Almost half of this coal is sub-bituminous, the balance of lignite and bituminous being in the proportion of 3.5 to 1. The main coal fields are on the west coast of the South Island and in the South Auckland (Waikato) area. Costs of transportation are high. Imports are small.

Oil. The amount of oil produced in New Zealand is negligible. Imports of mineral fuels, lubricants and related materials in 1961 totalled 176,725,000 gallons.

Natural gas. Natural gas has been found at Kapuni on the west coast of the North Island. Investigations are still being carried out and no decision has yet been reached as to how the gas might best be used.

Geothermal steam. At Wairakei, a few miles north of Taupo, in the North Island, geothermal steam has been harnessed for the generation of electricity, and a

power station of some 150,000 kW is in operation. Investigations are proceeding and further extensions to the station are expected.

The total hydro-electric power potential of New Zealand is not known precisely, as hydrological surveys have not been completed throughout the country. Investigations are now in progress on possible sources of hydro-electric power. It is understood that much of the hydro-electric power potential of the country is concentrated in the South Island, whereas the preponderance of population is in the North Island.

The total installed generating capacity in the country as of March 1963 was 1,945 MW, comprising 391 MW of steam thermal plants, 6 MW of internal combustion plants and 1,548 MW of hydro plants. Of the total generation of 7,951 million kWh, hydro stations contributed 6,779 million kWh (over 95 per cent). The rate of growth during the last three years (financial years 1960-61, 1961-62 and 1962-63) correspond to the doubling of energy generation every 10 years.

The annual per capita consumption of electricity in New Zealand was 2,671 kWh during the financial year ended March 1963. An analysis of the pattern of electricity consumption shows that about 58.7 per cent of the total consumption is taken by domestic customers, indicating the relatively high standard of living of the people.

Future development programmes

A very interesting and important project now on hand is the construction of a transmission line interconnexion between the North and South Islands. In 1962, after extensive investigations, the New Zealand Electricity Department commenced the task of erecting the 354-mile 500,000 volt direct current transmission line between Benmore in the South Island and Haywards in the North Island, which will incorporate a 25-mile submarine cable link across Cook Strait.

In the North Island, maximum run-off of water usually occurs in the winter, whereas in the South Island the maximum run-off for the snow-fed rivers such as the Waitaki and Clutha is in the summer months. With the interconnected system, lake storage problems should be greatly simplified and costs reduced. The diversity between the peak load in the two Islands is not as great as might be expected but even the 1 to 2 per cent diversity factor results in an appreciable saving in the capital cost of installed generating capacity.

Under New Zealand conditions, the cost of power produced in nuclear power stations would be higher than in coal-fired steam stations, which, in turn, have a cost of production at least twice as high as hydro stations. There appears to be no case for nuclear power stations for many years to come, therefore, especially in view of the hydro potential being developed in the Waitaki river basin, including Benmore and Aviemore, and the latest scheme which the Government has decided to develop at Manapouri. Geothermal steam is making a material contribution to electric power generation in the centre of the North Island. The Wairakei scheme is based on tapping a vast underground hot water system. Investigations for further steam sources are continuing adjacent to and within the producing area, and exploratory work is proceeding in other parts of the thermal zone. In the Waikato area, the Meremere coal-fired station makes a significant contribution to the North Island electric supply, but at a much greater cost per unit than hydro power.

With an electrical connexion between the North and South Islands, it is apparent that for many years to come, as in the past, electric power in New Zealand will be mainly derived from hydro resources.

According to the estimates prepared by the Planning Committee on Electric Power Development in New Zealand (September 1963), the addition to the generating capacity in the country between 1963-64 and 1973-74 (10 year period) will be as follows:

	North Island	*South Island*	*Total*
Thermal stations	181 MW	—	181 MW
Hydro stations	344 MW	1,150 MW	1,494 MW
TOTAL	525 MW	1,150 MW	1,675 MW

PAKISTAN

The electricity industry has shown an upward trend in recent years. Energy production increased at the rate of 11.4, 25.5 and 26.9 per cent in the years 1960, 1961 and 1962 respectively. During the year 1962, the total generation by public electricity supply undertaking in the country was 2307.487 million kWh as compared to 1818.929 million kWh in 1961. Among the three main conventional methods of electricity generation viz. hydro-electric plants, steam power plants and diesel power plants, hydro-electric plants have been predominant. In 1962, hydro-electric plants generated as much as 54.9 per cent of the total electricity output, generation by steam and diesel being 40.6 and 4.5 per cent respectively.

With the installation of a few new power plants such as the Karnfuli hydro-electric plant, the total installed capacity within the country rose sharply from 687,690 kW in 1961 to 838,812 kW in 1962 representing an increase of 22.0 per cent. Of the total installed capacity, government and private undertakings accounted for 79.5 and 20.5 per cent respectively. The relatively low increase in generation in East Pakistan as against the increase in the installed capacity in 1962 was attributed to lack of distribution facilities. However, schemes are under way to lay out a network of transmission and distribution lines. The installed capacity and generation of electric energy is expected to rise further on the completion of new power development projects such as the Multan thermal extension scheme

of 130 MW the Quetta thermal scheme of 15 MW and the Sukkur thermal power scheme of 20 MW, which are at various stages of completion.

The voltages in use for generation in the country include 11 kV, 6.6 kV and 0.4 kV. High voltage distribution systems are standardized at 11 kV and low voltage distribution systems at 400/230 volts, 3-phase and 4-wire. The transmission voltages are 66 kV, 132 kV and 220 kV.

The per capita consumption of electricity rose from 13.59 kWh in 1961 to 17.67 kWh in 1962, as a result of the substantial development in the industrial and agricultural sectors of the country's economy. The consumption is still low compared with the industrially advanced countries, but with further industrialization and mechanization of agriculture, the consumption is expected to rise further. The consumption of electricity for domestic use has also gone up as people are becoming more and more electricity-minded with the rise in the standard of living.

The losses in transmission and distribution in West Pakistan in 1962 were 22.3 per cent. These losses also include the energy used in the grid substations. There was a reduction in losses in 1963 indicating an improvement in the transmission and distribution system.

Rural electrification is undoubtedly of importance to Pakistan, as nearly 75 to 80 per cent of the population live in rural areas. As in the other countries of the region, the financial and economic aspects of this problem are indeed difficult. In West Pakistan, under a scheme for the electrification of 2,000 villages, supply was extended to 215 villages during 1962, as against 261 in 1961. Efforts were made to secure a loan from a group of Italian firms to speed up the rural electrification programme. Efforts are also being made, to the extent that funds are available, to promote electricity supply in East Pakistan. In developing electric supplies in rural areas, the objectives are to provide facilities for irrigation pumping and to give impetus to the development of cottage and village industries.

Compared with the long-term needs of the country, the known conventional power resources (water, natural gas, oil and coal) are limited, and sooner or later it will be necessary to turn to nuclear resources for power supply. Pakistan has, accordingly, commenced studies of this problem with a view to introducing nuclear power installations in both the East and West Wings. At the request of the Government, the International Atomic Energy Agency undertook in 1962 a study of the prospects for nuclear power in Pakistan, and later in the year made a preliminary assessment of various sites for locating the nuclear stations. It is tentatively proposed to install a station of about 100 MW in the Karachi region and one of about 50 MW at or near Roopur in East Pakistan. The International Atomic Energy Agency has been requested to assist in outlining preliminary specifications and to give advice on the calling and evaluation of bids etc.

PHILIPPINES

Review of present status of power development
Power situation in the Manila area and Luzon

The Manila area is presently served by the Manila Electric Company (MERALCO). This is the largest private electric utility in the Philippines. Its peak demand for 1962 was 439,800 kW or an increase of about 10.5 per cent over the previous year's peak demand of 398,000 kW. The total energy generated and purchased by this company in 1962 was 2,295,242,142 kWh compared with 1,937,827,000 kW in 1961. This represents an increase of 18.3 per cent.

The generating facilities of MERALCO consist of the 16,960 kW hydro-electric plant at Botocan, the 34,500 kW Blaisdell steam-electric station in Manila, and the 245,000 kW Rockwell steam-electric station in Makati, a nearby suburb; the total installed capacity is 296,460 kW. The two Rockwell 60 MW steam units, being new, can be overloaded, thereby increasing MERALCO's total capacity to 324,000 kW. To augment its generating facilities, MERALCO purchased in 1962 from the National Power Corporation (NPC) 36,000 kW from the Caliraya and 116,000 kW from the Ambuklao-Binga hydro-electric plants, or a total of 152,000 kW. In 1961, it purchased 153,000 kW from the National Power Corporation, i.e. 1,000 kW more than in 1962.

The energy requirements of the Manila integrated system belonging to MERALCO in 1961 were 1,937.8 million kWh. Its generating facilities supplied 1,250.7 million kWh or about 64.5 per cent of the total requirements, while 687.1 million kWh representing about 35.5 per cent of the total requirements were purchased from the NPC's Ambuklao-Binga and Caliraya hydro-electric plants. In 1962, the total energy requirements of the Manila integrated system were 2,295.2 million kWh. The generating plants of MERALCO supplied 1,622.4 million kWh representing 70.7 per cent of the total requirements, while 672.8 million kWh representing 29.3 per cent of the total requirements were supplied by NPC's Ambuklao-Binga and Caliraya hydro plants.

During the last few years, industries have tended to converge in the Manila area. However, with the extension of NPC's transmission lines to more remote areas in Central Luzon, several industries are being established or are planned outside the Manila area. Domestic consumption is expected to increase due to the availability of adequate, reliable and relatively cheap electric power.

In Luzon island, the National Power Corporation has in operation three major power plants, Caliraya Lumot—36,000 kW, Ambuklao—75,000 kW and Binga

— 100,000 kW. Apart from feeding the MERALCO system, the National Power Corporation has plans to provide electricity from these and other future stations to as many towns as possible by further extension of its transmission lines in Luzon. However, because of the scattered and isolated location of the various provincial electric utilities, not all of these towns can immediately be connected to the Luzon grid.

The Central Luzon Electrification Project covers the provinces of La Union, Pangasinan, Tarlac, Pampanga, Nueva Ecija, Bataan and Bulacan. Out of 173 towns in these provinces, 133 have electricity, 84 of them being served by the NPC. After the completion of the second phase of the Central Luzon Electrification Project, which will also include the province of Bulacan, 159 towns will be supplied, 142 of them by the NPC. The NPC is also supplying the Bacnotan Cement Industries in Bacnotan, La Union; Central Azucarera de Tarlac in Tarlac, Tarlac; NASSCA in Mariveles, Bataan; Basa Air Base in Floridablanca, Pampanga; Canlubang Sugar Estate in Laguna; Ft. Magsaysay in Laur, Nueva Ecija; and Civil Aeronautic Administration in Sta. Rosa, Nueva Ecija.

The Laguna-Batangas Electrification Project is presently serving 9 towns and the following entities: International Rice Research Institute, Canlubang Sugar Estate, BSP Jamboree City, Forest Product and Research Institute, UP College of Agriculture, PAF Fernando Air Base and the Philippine Power Development Company, and the Cottage Textile Development Corporation at Ibaan, Batangas. The second phase of the project covering extension of the transmission system to 15 other towns including a sugar central in the province of Batangas has been approved by the National Power Board for implementation.

Under the Ilocos Electrification Project, only the towns of Vigan, Ilocos Sur and Laoag, Ilocos Norte are presently served by means of isolated diesel plants. This project plans to connect Vigan and Laoag with the Ambuklao-Binga System. It will also serve 32 other towns of Abra, Ilocos Norte and Ilocos Sur. The project report has been approved by the proper authorities. The peso financing will come from bond issues and the foreign materials from Reparations. The bidding for these line materials and substation equipment was opened on 6 May 1963 in Tokyo. The materials were expected to arrive in Manila before the end of 1963.

Power situation in Mindanao

Compared with other islands, Mindanao Island possesses a relatively large water power potential, but, owing to the sparse population, the demand for power is relatively small. The National Power Corporation has built several small hydro-electric stations on streams on this island, namely, the Agusan river (1,600 kW) and the Digos river (200 kW), and a series of four stations on the Talomo river (2,900 kW in all). But by far the most interesting power development project on Mindanao is the harnessing of Lake Lanao and the Agus river. The Agus river flows out of the natural Lake Lanao and, within its short course of 39 kilometres to the sea, it drops more than 600 metres. This river has a total power potential of 680,000 kW, with an annual energy generating potential of 4,534 million kWh. Investigations have shown that the power potential of the river can be developed at six convenient sites. Of these, the Maria Cristina Falls site (site no. 6) has a hydraulic head of 140 metres and a potential generating capacity of 200,000 kW. As a first step towards harnessing this large water power potential, the National Power Corporation in 1953 installed one 25,000 kW generating unit. Simultaneously, to provide revenue-paying loads for this large power plant, the Corporation established, on its own, an ammonium sulphate fertilizer factory with an annual production capacity of 50,000 tons. A second generating unit (25,000 kW) at the Maria Cristina Falls power station was completed in 1956. But for the co-ordinated development of the power project and the fertilizer industry, it would not have been economically feasible to develop the power potential of the Agus river. In due course, other industries, namely, a calcium carbide plant and a steel rerolling mill, were attracted to Mindanao, and so increased the power offtake from the Maria Cristina Falls station. According to the plans of the National Power Corporation, it is proposed to install the third and fourth generating units, each of 50,000 kW capacity, bringing the total generating capacity of the station to 150,000 kW. According to the present programme, the third unit will be in operation in 1964.

Customers presently being served from the Maria Cristina plant are as follows:

	1962 power and energy supplies	
	kW	*kWh*
NASSCO Steel Mill	9,007	23,456,640
Marcelo Ferti-Plant	23,900	133,766,000
MC Chemical Industries	5,300	32,540,900
Iligan City	950	4,341,120
Pillsbury-Mindanao Flour Milling	880	1,287,120
MPCC	1,740	571,200
	41,777	195,962,980

Apart from the Maria Cristina plant, there are a few other small hydro-electric and diesel plants being operated by the National Power Corporation in Mindanao. Power in bulk is being supplied from these local stations to several private electric utilities for retail distribution to the public.

Trends of energy growth and utilization

Between 1960 and 1962, the aggregate generation of electricity increased in the country from 2,259 million kWh to 3,010 million kWh, the annual rate of growth being about 13.0 per cent in 1961 and 17 per cent in 1962. Against the total generation of 3,010 million kWh

in 1963, the total sales amounted to 2,529 million kWh, thus the total losses arising from consumption by power station auxiliaries and from transmission and transportation losses amounted to only 15.9 per cent. Of the energy sales by all public utilities, domestic commercial and miscellaneous consumers accounted for about 58 per cent and industries about 42 per cent. However, if the energy generated by industries from their own plants is also taken into account, the proportion of the total energy consumed by industries increases to 54 per cent.

Various practices adopted by the National Power Corporation to improve the economics of power supply are:—

(1) Feedback arrangement with MERALCO. The NPC operates hydro plants and MERALCO operates its steam plants. With a co-ordinated interchange of energy, the NPC can supply fully the energy requirements of its customers and MERALCO can operate its steam plants at maximum efficiency.

(2) Diesel units have been added to the NPC's small hydro plants to supply the load in times of low water.

(3) Centralized metering for two or more points of power delivery. With centralized metering, there will be less metering equipment and billing will be much simplified.

(4) Balancing of loads between neighbouring substations. The San Fernando load-centre substation, which was for a long time overloaded, has been relieved by shifting the Angeles town load to the Mexico substation. The voltage regulation at the loads was also improved.

(5) Installation of automatic power reclosers. Reclosers were installed in place of power circuit breakers which are costly and require an attendant, or in place of power fuses, which are very troublesome especially when the fault occurs frequently.

(6) Co-ordinated operation of Ambuklao-Binga reservoirs. During the dry months, Binga's downstream reservoir is set at a high elevation while the elevation of Ambuklao's upper stream reservoir is drawn down to the dead storage elevation depending on the load. Thus Ambuklao is made to carry most of the load. When the elevation at Ambuklao is low, elevation at Binga is drawn down to give time for Ambuklao to recover its lost head. During the wet months, it is advisable for Binga to draw down its elevation and generate as much energy as possible. The beneficial effects of the foregoing operation are: maximum energy draw, higher efficiency of the units, less spilling in the reservoirs, and consequently more income to the Corporation.

(7) Protective coating on the insulators to minimize line outages. The insulators on critical sections of the transmission lines were coated with silicon compound with satisfactory results.

(8) Reforestation near the reservoir area. This activity helps to ensure water supply with less soil erosion and less silt deposits.

Future power programme

According to the ten-year power programme of the National Power Corporation, the following installations are to be connected to the Luzon and Agus grids:

Luzon grid	*Installed kW*	*Expected Year of initial operation*
Angat	206	Early 1966
Thermal no.1	75	1967
Thermal no.2	75	1968
Tabu	75	1969
Thermal no.3	100	1970
Thermal no.4	100	1971
Tayum and Kalipkip	95	1972
Thermal no.5	100	1973
Transmission:	As required	
Total Luzon grid	826	
Agus grid		
MC 3	50	1966
Agus 2	100	1967
MC 4	50	1970
Agus 1	75	1973
Transmission:		
Total Agus grid	275	

Future small plants total 50 MW installed capacity.

THAILAND

The aggregate installed capacity of the power supply industry in the country as a whole rose from 177.6 MW in 1960 to 273.2 MW in 1962. The additions comprised the new 75 MW steam station in Bangkok (February 1961) and small diesel stations which were installed in several towns. Apart from small diesel plants, no major plant was added in 1962, but a second 75 MW generating set was added at Bangkok in 1963. The total energy generation increased from 501 million kWh in 1960 to 709 million kWh in 1962; the annual growth rate was 18.7 per cent in 1961 and 15.9 per cent in 1962. In 1962, industries consumed about 43 per cent of the total electric energy consumption. As a result of the special efforts being made to develop new industries, it is expected that the industrial load will rapidly increase in the near future and that the rate of growth of electricity generation will have to be maintained at a high rate in the ensuing years.

Bangkok Region and Metropolitan Electricity Authority

The 75 MW steam station commissioned by the Yanhee Electricity Authority (YEA) in February 1961 to meet the immediate needs of the Thonburi area, the largest load centre, was the first modern power plant in Thailand. Subsequently a second unit of the same

capacity was added and put into commercial operation in July 1963. This plant is of the unit type, with the alternator, turbine and boiler of each set tied together to operate as one unit. The steam conditions are 1,450 psig pressure and 1,000°F temperature, the steaming capacity of the boiler being 580,000 lb/hour. In 1964, when the Yanhee hydro station is completed and connected to Bangkok, the Bangkok steam station will be interconnected with the hydro station and the two power plants will be operated on an integrated basis.

Meanwhile, the reorganization of the distribution system in Bangkok-Thonburi, which is the responsibility of the Metropolitan Electricity Authority, has made good progress. The new or remodelled distribution system, designed for a capacity of 250 MW, includes three main 230/69 kV substations connected with a 230 kV line from Yanhee hydro station, 69 kV multi-feed radial subtransmission lines, nine 69/12 kV substations and 12 kV distribution lines and cable networks. The ultimate consumer voltage is 220 V single-phase or 380 V 3-phase. Along with the establishment of the new distribution system, the MEA has been raising the service voltage for low tension consumers from the former 110 V to 220 V single-phase and to 380 V 3-phase, which have been adopted as standards. The new distribution system and the increase in consumers' supply voltage will, it is hoped, substantially reduce the losses in the system.

With the introduction of a reliable and ample supply of electric power in the Bangkok area, the MEA also undertook to revise the tariff rates on a generally accepted, rational and scientific basis. The revised tariff which provides for the reduction of rates in most cases has been in effect since 1 October 1962. The new two-part tariffs applicable to industry and large power consumers coupled with other developments such as the availability of ample supply and the improvement of the distribution system, have resulted in a substantial increase in the energy offtake in Bangkok and Thonburi areas; in 1962 the total energy sales increased by about 18.7 per cent and the number of customers by about 10.6 per cent. The system peak demand reached 112 MW in 1962 and the total energy sales in the year amounted to 498 million kWh, which represents more than 75 per cent of the energy sales in the country as a whole.

Yanhee Electricity Authority

In the province of Tak in the north-west region of the country, about 450 km north of Bangkok, is the site of the major multi-purpose Yanhee project. The dam, named Bhumiphol after the King of Thailand, has been completed recently and the hydro-electric station is scheduled to be commissioned in May 1964. This station will have an ultimate capacity of 560 MW, but in the initial stage only two units each of 70 MW have been installed. A double circuit 230 kV line, 444 km long erected on double-circuit steel towers, connects the hydro station to Bangkok, and several 69 kV lines, erected on wood poles, have been built to serve various load centres. The transmission system in the first stage includes six 230/69 kV substations and several 69/11 kV substations. The grid system of the Yanhee project will cover about 18 provinces in the initial stage, including the provinces of Bangkok and Thonburi. At a later stage when the additional units are installed at the hydro station, the grid area will be extended to cover 36 provinces in all. The two existing steam stations, namely the North Bangkok station and the 12.5 MW station at Mae Moh lignite mine in the north-west, are located in the Yanhee grid area and will be operated in co-ordination with the hydro station at Bhumiphol dam on an integrated basis.

Lignite Authority

In the province of Krabi in the southern peninsula, the Lignite Authority (LA) has opened a lignite mine and has on hand the construction of a lignite-burning power station consisting initially of two 20 MW units. Included in this project is the construction of 600 km of 115 kV transmission lines on wood poles and nine 115/33 kV substations, of which two will have a capacity of 12 MVA each and the other seven of 6 MVA each. This project, when completed for operation in the first half of 1964, will supply power to 10 provinces where the tin mining industry is located. At present, the mines are operating their own power plants, but with the availability of a dependable supply from the new central station at economical rates, the miners are expected to change over to the public utility supply. Load growth in this area may be so rapid that further extensions of this plant may be required in near future.

North-East Electricity-Authority

In the north-east region of the country, two projects are being developed on tributaries of the Mekong river, namely the Nam Pong project and the Nam Pung project. Investigations and studies for the development of international projects on the Mekong main stream and national projects on its tributaries in the riparian countries have been carried out by the Committee for Co-ordination of Investigations of the Lower Mekong Basin.

The Nam Pong project involves a main rock fill dam 800 metres long and 30 metres high, a power house, an irrigation diversion dam downstream from the main dam, a 115 kV transmission line (446 km), 22 kV subtransmission lines (88 km) and five main substations. The power house will be equipped in the initial stage with two 8.7 MW Kaplan turbine generators; a third unit of the same capacity will be added later. It is planned to supply power to eight provinces in that area. A new autonomous agency called the North-East Electricity Authority (NEEA) was established to undertake this project under the provisions of an act proclaimed on 30 October 1962. The final design of the

project was completed and tender specifications were prepared in 1963. Construction on the main dam commenced in January 1964. This project is scheduled for completion around the end of 1965.

National Energy Authority

The Nam Pung project is on the river of the same name near Sakon Nakorn town. This multi-purpose project includes a rock fill dam 40 metres high and 1,719 meters long, a power house with two 3,500 kVA turbine generators, a 99 km long 66 kV line, a 100 km long 22 kV line, and substations. Power supply will be afforded in two provinces. The National Energy Authority (NEA), in addition to its over all responsibility for the development of energy resources in the country, has been entrusted with the execution of the project. A reconnaissance survey was made in 1961, followed by a feasibility study in 1962. The project design was completed in June 1963 and the construction work has since commenced. This project is scheduled for completion in August 1965.

Provincial Electricity Authority

With the construction of large and small central power stations by the YEA, NEEA, LA and NEA, etc., the Provincial Electricity Authority, which is responsible for the distribution of electric power in all provinces throughout the country except Bangkok and Thonburi, has been developing and improving the distribution facilities in the areas served by the grid systems of the Yanhee, Krabi, Nam Pong and Nam Pung projects, in order to make the best economic use of these power projects.

VIET-NAM, REPUBLIC OF

Present status of electricity supply

The installed generating capacity in the Republic of Viet-Nam increased from 98.5 MW in 1960 to 102.1 MW in 1961 and 115.5 MW in 1962. During the same period, the figures for generation of electricity were 304, 329 and 375 million kWh respectively, representing an increase of 8.3 per cent in 1961 and 14.6 per cent in 1962. Much of the generating capacity in 1962 comprised diesel engine generating units distributed in various small and medium-sized towns. Saigon had a thermal plant with a capacity of about 49 MW, which accounted for nearly 58 per cent of the generation in the whole country. The losses of energy in station auxiliaries and in transmission and transformation amounted to about 18 per cent in 1962. In 1960, it was about 21.7 per cent. The estimated per capita electricity consumption in 1962 was 21.2 kWh per year.

Development programme

The first and second stages of the Da Nhim project, involving a total installed capacity of 160 MW, are being put into effect. The first stage with two machines each of 40 MW was commissioned recently and two more machines of the same capacity will be ready by 1965. The 230 kV transmission line from the Da Nhim station to the Saigon area has also been completed. Da Nhim power has been supplied to the Gia Dinh, Bien-Hoa and Thudaumot provinces bordering on Saigon, and Saigon itself is expected to be connected by the middle of 1964. The cost of the project is as follows:

Particulars	*Foreign exchange (US$)*	*Local currency (US$)*	*Total (US$)*
Civil engineering works—dam, tunnels and power station building	17.2	18.30	18.98
Penstocks and gates	3.3	0.38	3.34
Power plant and equipment	5.7	0.72	5.77
Total for the power stations ...	26.2	19.4	45.6
Transmission line (230 kV)	3.8	1.4	5.2
Substation (Saigon)	3.5	0.97	4.47
Total	33.5	21.77	55.27

The foreign exchange cost of the project is being financed partly through the Japanese War Reparations Agreement and partly by a loan from the Export-Import Bank of Japan.

To reinforce the power supply and distribution capacity of the Saigon area and to co-ordinate with the Da Nhim hydro-electric station, the Thu-Duc thermal power station is under construction. This station will have a capacity of 33 MW, (maximum output 37.5 MW) and will operate at steam conditions of 850 psig and 900°F. The project includes the construction of 45 km of 66 kV sub-transmission lines and 40 km of 15 kV primary distribution lines. The foreign exchange expenditure amounting to US$12.7 million will be financed by the United States AID. The local currency expenses are estimated at 270 million Piastres or US$6.57 million. This station is expected to be commissioned by 1965.

A third project under active consideration is the An-Hoa thermal power station in conjunction with a chemical fertilizer plant. The proposal is to build a thermal power station with two units each of 13,500 kW. This installation will be integrated with a urea manufacturing plant (capacity about 60,000 tons of urea per year) with proper co-ordination of the steam and power requirements of the factory. There is a possibility that this station will also supply other miscellaneous consumers, such as sugar refineries, carbide plants, textile mills and irrigation facilities.

WESTERN SAMOA

Organization of electricity supply industry

Electricity supply in Western Samoa is practically entirely owned and managed by the Government through the electrical section of the Public Works Department. Outside the Government's electric power scheme, there are six local village schemes of 15 to 72 kVA capacity,

and a number of small private generating units. The village schemes are run by village authorities in a co-operative manner.

An over-all development plan for electricity supply, it is reported, will be worked out following the proposals of a United Nations economic survey prepared in 1962. The survey suggests "more ample and widely distributed supply of electric power under central supervision, including more village schemes".

Current legislation and regulations are the Electric Lines Ordinance 1950 (with Amendment of 1953), and the Electrical Supply and Wiring Regulations 1951, which are largely modelled after New Zealand regulations with only minor alterations.

Present status of the electricity supply industry

There are no natural fuel resources suitable for the generation of electricity. Diesel oil is imported for generation.

In spite of high yearly rainfall and the mountainous nature of the country, there are not many sites suitable for hydro power development. Small dams for water flow recordings are under construction at two of the more promising sites, Afulilo Falls (Salani river scheme in Upolu) with an estimated maximum output of 5,000 kW, and Palauli in Savai'i, with an estimated power potential of about 100 kW.

Co-ordinated electricity supply to the general public is at present, except for six small local village schemes, limited to the urban area of Apia and some surrounding villages. Electricity is distributed there at 6.6 kV and 2.2 kV to approximately 2,100 separate customers within an area of 12 square miles. There were, in 1962, three hydro power stations having 1,310 kW combined capacity and two diesel units (565 kW in all) in the area. All these generating stations are owned by the Government.

Distribution

Within the distribution area (Apia urban area plus a few villages) there are 34.6 km of 6.6 kV overhead lines and 20.6 km of 2.2 kV cables for transmission and high tension distribution. At present, some of the transmission lines from the generating stations are also feeding distribution transformers. This method is planned to be abandoned gradually, as the network develops, in favour of a centralized system with a main switching station at Lalovaea near the centre of the area. The voltages now in use are 6.6 kV, 2.2 kV, 400V and 230.V. There are at present 63 6.6 kV/400V and 26 2.2 kV/400V transformers in the area, with ratings from 5 to 100 kVA.

There is practically no industrial load on the system. 76 per cent of consumption is domestic and residential, 24 per cent commercial.

One common tariff rate (effective rate 3d to 2.5d per kWh) is applied to all customers. Of the total revenue from energy charges in 1962, 78.5 per cent was contributed by domestic consumers and 21.5 per cent by commercial consumers. There is no service connexion fee, but £1 is charged for reconnexion.

Future development of the electricity supply industry

Plans for future development of electric power supply, it is expected, will be worked out by the Public Works Department with the assistance of United Nations technical experts, who arrived during 1963. A source of supply of finances for future development may be from an internal development loan.

Part II

STATISTICAL TABLES

See the explanatory note on page vii, for symbols, abbreviations and definitions

Summary of Statistics for 1961 and 1962[a]

Country	Year	Installed generating capacity (thousand kW): Steam	Hydro-electric	Diesel	Total	Increase over previous year (percentage)	Generation (million kWh): Steam	Hydro-electric	Diesel	Total	Increase over previous year (percentage)	Total length of high voltage transmission and distribution lines (circuit km)	Energy consumed by station auxiliaries and energy losses in transmission and distribution (in percentage of the total energy generation)	Average fuel consumption of steam plant in kg coal equivalent per kWh generated	Average steam plant thermal efficiency in per cent	Per Capita generation (kWh)	Average revenue per kWh sold (US cents)
Afghanistan[b] . . .	1961	5.0	48.0	6.0	59.0	15.7	2.0	116.0	5.0	123.0	4.2	365	. . .	. . .	. . .	8.9	2.58
	1962	4.7	47.9	7.7	60.3	2.2	8.2	148.8	3.5	160.5	30.2	365	. . .	. . .	. . .	10.9	. . .
Australia[c]	1961	4,992.0	1,522.0	221.0	6,665.0	12.0	19,293.0	4,662.0	d	23,955.0	7.8	. . .	18.3	. . .	. . .	2,280.0	1.29
	1962	5,165.0	1,826.0	224.0	7,215.0	8.3	20,485.0	4,968.0	d	25,453.0	6.3	. . .	14.5	. . .	. . .	2,378.0	1.24
Brunei	1961	—	—	3.2	3.2	—	—	—	7.5	7.5	15.4	39	7.8			122.6	4.3
	1962	—	—	4.3	4.3	34.4	—	—	8.3	8.3	10.7	48	12.0			132.0	4.3
Burma[e]	1961	57.7	84.5	48.7	190.9	0.2	43.7	182.3	61.3	287.3	13.0	4,188	27.7	0.97	13.0	15.0	10.9[f] and 2.1[g]
	1962	57.7	84.5	48.2	190.4	−0.3	47.0	207.5	67.8	322.3	12.2	4,529	30.2	1.06	12.0	14.5	9.8[f] and 1.5[g]
Cambodia	1961	3.0	—	23.5	26.5	1.5	7.9	—	6.3	74.2	21.0	35	29.5	. . .	. . .	13.9	. . .
	1962	3.0	—	31.1	34.1	28.7	8.2	—	74.1	82.3	—	120	24.7	0.68	12.0	14.3	. . .
Ceylon	1961	12.0	55.5	26.7	94.2	—	1.5	277.2	32.4	311.1	7.7	2,507	16.6[h]	. . .	. . .	30.6	3.1[h]
	1962	37.0	55.5	25.9	118.4	25.7	25.0	293.1	32.6	350.7	12.7	2,643	18.1[h]	. . .	. . .	33.6	3.0[h]
China (Taiwan) . .	1961	380.5	538.0	4.9	923.4	30.2	1,730.2	2,335.3	6.3	4,071.8[i]	12.6	16,677	16.1	0.54	24.1	372.0	0.8
	1962	380.5	538.0	4.9	923.4	—	2,524.2	2,157.5	2.2	4,683.9[i]	14.9	17,626	16.3	0.48	27.2	414.0	1.0
Hong Kong . . .	1961	365.0	—	0.2	365.2	—	1,542.1	—	0.3	1,542.4	18.5	1,246	13.8	0.56	25.6	493.0	2.7[j]
	1962	485.0	—	0.2	485.2	32.9	1,786.6	—	0.3	1,786.9	15.9	1,436	13.8	0.54	26.4	554.0	2.7[j]
India[k]	1961	2,466.0	2,234.1	316.8	5,016.9	9.9	9,475.8	9,814.4	379.7	19,669.9	16.7	162,544	17.6	0.76	21.7	44.8	. . .
	1962	2,536.3	2,916.5	327.0	5,779.8	15.2	10,176.9	11,804.5	383.4	22,364.8	13.7	178,090	18.6	0.79	21.0	49.8	. . .
Indonesia	1961	24.6	168.2	118.0	310.8	. . .	57.0	774.5	388.5	1,220.0	. . .	6,888	27.3	. . .	. . .	12.8	. . .
	1962	45.8	170.9	141.7	358.4	15.3	72.6	777.3	392.2	1,242.1	1.8	6,888	19.3	1.42	9.2	12.9	. . .
Iran[l]	1961	89.0	77.0	189.0	355.0	26.8	433.0	8.0	499.0	940.0	9.3	482	. . .	. . .	. . .	43.7	. . .
	1962	89.0	207.0	194.0	490.0	38.1	360.0	100.0	540.0	1,000.0	6.4	504	. . .	. . .	. . .	46.2	. . .
Japan[k]	1961	10,146.0	12,575.0	34.0	22,755.0	10.2	54,313.0	62,426.0	70.0	116,809.0	14.9	76,897	13.1	0.48	27.5	1,240.0	1.6
	1962	12,280.0	13,184.0	39.0	25,503.0	12.1	66,808.0	57,119.0	92.0	124,019.0	6.2	78,880	13.2	0.43	30.8	1,308.0	. . .
Korea, Republic of	1961	222.5	143.5	1.3	367.3	—	1,118.3	652.5	2.1	1,772.9	4.3	20,647	32.9	0.80	22.7	71.1	2.5[m]
	1962	252.5	143.5	38.0	434.0	18.2	1,198.6	702.3	77.2	1,978.1	11.6	18,940	25.7	0.79	23.2	75.3	2.7[m]
Laos[n]	1961	—	—	4.6	4.6	21.0	—	—	8.0	8.0	16.0	19	21.3			3.4	. . .
	1962	—	—	4.6	4.6	—	—	—	9.4	9.4	17.5	26	24.5			3.8	. . .
Malaysia a. Former Federation of Malaya . . .	1961	246.0	30.2	39.1	315.3	3.6	961.8	184.7	92.0	1,238.5	14.1	3,526	15.3	0.72	23.9	181.5	3.1
	1962	228.4	30.2	46.0	304.6	−3.4	1,048.1	200.9	117.7	1,366.7	10.4	3,785	10.9	0.73	23.6	187.5	2.7

Summary of Statistics for 1961 and 1962[a] *(Continued)*

Country	Year	Installed generating capacity (thousand kW): Steam	Hydro-electric	Diesel	Total	Increase over previous year (percentage)	Generation (million kWh): Steam	Hydro-electric	Diesel	Total	Increase over previous year (percentage)	Total length of high voltage transmission and distribution lines (circuit km)	Energy consumed by station auxiliaries and energy losses in transmission and distribution (in percentage of the total energy generation)	Average fuel consumption of steam plant in kg coal equivalent per kWh generated	Average steam plant thermal efficiency in per cent	Per Capita generation (kWh)	Average revenue per kWh sold (US cents)
North Borneo (Sabah)	1961	—	—	9.8	9.8	6.5	—	—	18.7	18.7	24.7	113	10.8			41.5	6.0
	1962	—	—	9.2	9.2	-6.1	—	—	22.9	22.9	22.5	145	10.9			51.0	5.7
Sarawak	1961	—	—	11.1	11.1	13.2	—	—	23.6	23.6	24.9	93	17.8			30.3	7.6
	1962	—	—	11.9	11.9	7.2	—	—	27.2	27.2	15.9	120	15.8			34.0	6.6
Singapore	1961	152.0[o]	—	36.0[p]	188.0	—	709.8	—	9.8[p]	719.6	9.2	1,064	11.5	0.48	27.4	388.0	2.5
	1962	177.0[o]	—	36.0[p]	213.0	13.3	771.8	—	3.9[p]	775.7	7.8	1,158	11.1	0.49	27.2	408.0	...
Nepal	1961	—	3.4	3.0	6.4	—	—	6.8	4.1	10.9	-3.5	75	29.4			1.2	...
	1962	—	3.4	3.9	7.3	14.1	—	7.0	5.6	12.6	15.6	75	30.2			1.3	...
New Zealand[k]	1961	320.0	1,481.0	14.0	1,815.0	15.9	1,453.0	5,946.0	—	7,399.0	8.3	16,757	16.7	...	...	3,055.0	1.6
	1962	391.0	1,548.0	6.0	1,945.0	7.2	1,172.0	6,779.0	—	7,951.0	7.5	17,522	15.9	0.67	24.6	3,139.0	1.6
Pakistan	1961	340.0	253.4	94.3	687.7	4.5	797.8	800.8	220.3	1,818.9	25.5	16,504	29.3	0.69	18.9	19.2	...
	1962	408.5	333.4	96.9	838.8	22.0	937.3	1,267.4	102.8	2,307.5	26.9	21,182	25.7	0.61	21.4	23.8	...
Philippines	1961	288.1	290.3	74.2	652.6	9.4	1,232.2	1,186.8	136.3	2,555.3	13.1	2,314	13.9	0.44	29.6	89.5	3.0[q]
	1962	288.1	291.1	81.9	661.1	1.3	1,607.3	1,246.5	156.3	3,010.1	17.8	2,492	15.9	0.39	33.4	101.8	3.1[q]
Thailand	1961	135.0	—	129.5	264.5	49.0	396.6	—	205.2	601.8	20.0	1,234	24.2	0.62	20.8	22.5	4.1
	1962	137.6	—	135.6	273.2	3.3	544.2	—	155.5	700.3	16.4	1,390	23.6	0.46	28.1	25.3	3.1
Viet-Nam, Republic of	1961	49.0	3.9	49.2	102.1	3.7	216.7	10.0	101.9	328.6	8.1	628	17.5	0.77	16.2	22.7	...
	1962	49.0	4.0	62.5	115.5	13.1	218.1	17.5	139.3	374.9	14.1	709	17.8	0.83	16.3	25.2	10.2
Western Samoa	1961	—	1.3	0.6	1.9	—	—	4.9	[r]	4.9	11.3	...	...			43.8	3.4
	1962	—	1.3	0.6	1.9	—	—	4.9	0.8	5.7	16.3	55	21.0			48.8	3.5

[a] No data available for Mongolia.

[b] Relating to fiscal year ended 20 March of subsequent year and to power stations of 100 kW and over and including self-supplying industial plants.

[c] Relating to fiscal year ended 30 June of the specified year.

[d] Included in the generation of steam plant.

[e] Relating to fiscal year ended 30 September of the specified year.

[f] Relating to Electrical and Mechanical Department of the Electricity Supply Board.

[g] Relating to Electricity Supply Board, Hydel Department.

[h] Relating only to the Department of Government Electrical Undertakings.

[i] Net generation, not including consumption by station auxiliaries.

[j] Relating only to Hong Kong Electric Co., Ltd.

[k] Relating to fiscal year ended 31 March of subsequent year.

[l] Relating to fiscal year ended 20 March of subsequent year.

[m] Exchange rate 130 Won (1,300 Hwan) per US$; former exchange rate of 650 Hwan per US$ no longer applicable.

[n] Including also gas engine plants.

[o] Including a 2 MW stand-by open cycle gas turbo-alternator house set.

[p] Free piston gas turbine set at St. James' power station on experimental run.

[q] Excluding National Power Corporation (NPC) sales to utilities.

[r] Included in the generation of hydro-electric plant.

Table 1. INSTALLED CAPACITY AND ENERGY GENERATION OF PUBLIC SUPPLY UTILITIES, 1951 AND 1956 TO 1962

A. ECAFE region

Year	Aggregate installed generating capacity: Thousand kW	Aggregate installed generating capacity: Increase over previous year (percentage)	Energy generation: Million kWh	Energy generation: Increase over previous year (percentage)
1951	15,441.5	3.7	66,037.8	7.9
1956	23,987.4	8.5	103,128.2	14.3
1957	25,235.1	4.2	115,953.8	12.1
1958	27,404.2	8.6	125,027.4	7.8
1959	32,776.5	20.3	142,102.0	14.0
1960	37,208.6	12.6	163,541.7	14.5
1961	41,191.4	10.9	185,903.7	13.8
1962	45,982.4	11.6	200,505.8	7.9

Note: Figures relate to public supply utilities only. The energy generation includes the energy produced by public utility plants and the energy purchased from the self-supplying industrial plants for supply in public utility systems.

The installed capacity of and the energy produced and consumed for their own use by the self-supplying industrial plants and other particulars relating to industry are indicated in table 11.

Owing to non-availability of complete information, Figures for Iran, Mongolia and Western Samoa are included only for the following years:—

Iran for 1957, 1958, 1960, 1961 and 1962

Mongolia for 1957 to 1960

Western Samoa for 1957 to 1960.

The percentage increase figures for the region in 1957 are therefore exclusive of Iran, Mongolia and Western Samoa.

The percentage increases in 1959 and 1960 are exclusive of Iran.

The percentage increases in 1961 and 1962 are exclusive of Mongolia.

The installed capacity of and the energy produced and consumed by the self-supplying industrial plants in Thailand are included in 1951, 1956 and 1957 but excluded in all later years.

Figures for installed capacity and generation appearing in this issue may in some cases be different from those included in the earlier issues of the "Electric Power Bulletin". The revised figures included in this publication are based on the data which have since become available from the countries.

Table 1. INSTALLED CAPACITY AND ENERGY PRODUCTION OF PUBLIC SUPPLY UTILITIES, 1951 AND 1956 TO 1962

B. Individual countries[a]

Country and year (1)	Installed generating capacity (thousand kW) (2)	Increase over previous year (percentage) (3)	Energy generation (million kWh): Public utility plants (4)	Energy generation (million kWh): Purchased[b] (5)	Energy generation (million kWh): Total (4)+(5)=(6)	Energy generation (million kWh): Increase over previous year (percentage) (7)
Afghanistan						
1951	11.3	—	24.3	—	24.3	1.2
1956	18.5	32.2	35.6	—	35.6	14.1
1957	33.2	79.5	42.8	—	42.8	20.3
1958	34.4	3.6	52.1	—	52.1	21.7
1959	34.4	—	84.0	—	84.0	61.3
1960[c]	51.0	15.7	118.0	—	118.0	
1961[c]	59.0	2.2	123.0	—	123.0	4.2
1962[c]	60.3	—	160.5	—	160.5	30.2
Australia[d]						
1951	2,478.0	—	10,420.0	—	10,420.0	10.4
1956	4,140.0	67.2	16,055.0	—	16,055.0	10.0
1957	4,705.0	13.6	17,593.0	—	17,593.0	9.6
1958	4,881.0	3.7	19,040.0	—	19,040.0	8.2
1959	5,531.0	13.3	20,388.0	—	20,388.0	7.1
1960	5,953.0	7.6	22,221.0	—	22.221.0	9.0
1961	6,665.0	12.0	23,955.0	—	23,955.0	7.8
1962	7,215.0	8.3	25,453.0	—	25,453.0	6.3

Table 1 B *(Continued)*
PUBLIC SUPPLY UTILITIES

Country and year (1)	Installed generating capacity (thousand kW) (2)	Increase over previous year (percentage) (3)	Energy generation (million kWh): Public utility plants (4)	Purchased[b] (5)	Total (4)+(5)=(6) (6)	Increase over previous year (percentage) (7)
Brunei						
1951	0.17	—	0.47	—	0.47	...
1956	1.4	41.4	2.9	0.5	3.4	63.6
1957	1.2	-14.3	3.3	1.6	4.9	43.3
1958	2.2	83.4	4.4	2.2	6.6	34.5
1959	3.2	45.5	5.5	2.5	8.0	21.8
1960	3.2	—	6.5	2.6	9.1	13.8
1961	3.2	—	7.5	2.8	10.3	13.2
1962	4.3	34.4	8.3	2.8	11.1	7.8
Burma						
1951	29.7	—	40.9	—	40.9	26.6
1956	55.6	12.5	112.2	—	112.2	20.0
1957	78.0	40.0	142.7	—	142.7	29.5
1958[e]	94.1	20.7	178.6	—	178.6	25.2
1959[e]	105.2	11.8	215.3	—	215.3	20.6
1960[e]	190.5	81.2	254.2	—	254.2	18.1
1961[e]	190.9	0.2	287.3	—	287.3	13.0
1962[e]	190.4	- 0.3	322.3	—	322.3	12.2
Cambodia						
1951	6.6	—	18.9[c]	—	18.9[c]	16.5
1956	12.2	6.1	34.4	—	34.4	17.2
1957	12.2	—	39.4	—	39.4	14.5
1958	18.5	51.7	46.3	—	46.3	17.5
1959	21.4	15.7	52.1	—	52.1	12.5
1960	26.3	22.9	61.3	—	61.3	17.7
1961	26.5	0.8	74.2	—	74.2	21.0
1962	34.1	28.7	82.3	—	82.3	10.9
Ceylon						
1951	52.7	—	96.2	—	96.2	21.6
1956	61.5	1.2	193.1	—	193.1	14.2
1957	65.5	6.5	200.0	—	200.0	3.6
1958	87.5	33.6	215.0	5.4	220.4	10.0
1959	94.2	7.7	251.6	—	251.6	14.0
1960	94.2	—	288.8	—	288.8	14.8
1961	94.2	—	311.1	—	311.1	7.7
1962	118.4	25.7	350.7	—	350.7	12.7
China (Taiwan)						
1951	305.0	—	1,278.7	6.4	1,285.1	23.5
1956	520.4	5.5	2,242.5[f]	7.3	2,249.8	14.4
1957	541.2	3.8	2,547.8[f]	7.4	2,555.2	13.6
1958	582.2	7.6	2,873.6[f]	6.7	2,880.3	12.7
1959	632.8	8.7	3,208.3[f]	4.5	3,212.8	11.5
1960	709.2	12.3	3,616.0[f]	12.0	3,628.0	12.9
1961	923.4	30.2	4,071.8[f]	11.9	4,083.7	12.6
1962	923.4	—	4,683.9[f]	8.8	4,692.7	14.9
Hong Kong						
1951	122.0	—	415.2	—	415.2	41.2
1956	175.2	—	710.0	—	710.0	11.0
1957	190.2	8.5	834.0	—	834.0	17.5
1958	245.2	29.0	929.1	—	929.1	11.3
1959	335.0	36.8	1,099.4	—	1,099.4	18.3
1960	365.2	9.0	1,301.5	—	1,301.5	18.4
1961	365.2	—	1,542.4	—	1,542.4	18.5
1962	485.2	32.9	1,786.9	—	1,786.9	15.9
India						
1951	1,835.0	—	5,858.0	—	5,858.0	14.7
1956	2,886.1	7.1	9,662.1	18.6-17.0[g]	9,663.7	12.0
1957[h]	2,914.1	—	2,548.5	5.8- 4.4[g]	2,549.9	
1957[i]	3,222.5	11.6	11,322.0	77.0-22.0[h]	11,377.0	17.5
1958[i]	3,512.0	9.0	12,994.0	35.0	13,029.0	14.5
1959[i]	3,873.2	10.2	14,991.5	33.9	15,025.4	15.4
1960[i]	4,563.3	17.8	16,854.6	224.1	17,078.7	13.6
1961[i]	5,016.9	9.9	19,669.9	367.0	20,036.9	17.2
1962[i]	5,779.8	15.2	22,364.8	469.0	22,833.8	13.9

Table 1 B *(Continued)*

Public supply utilities

Country and year (1)	Installed generating capacity (thousand kW) (2)	Increase over previous year (percentage) (3)	Energy generation (million kWh): Public utility plants (4)	Purchased[b] (5)	Total (4)+(5)=(6) (6)	Increase over previous year (percentage) (7)
Indonesia						
1951	178.6	—	614.0	—	614.0	24.8
1956	265.6	3.0	922.1	557.9	1,480.0	4.1
1957[j]	257.0		939.0	173.5	1,112.5	
1958[j]	262.5		1,143.9	160.8	1,304.7	
1959[j]	277.0		1,180.0	161.0	1,341.0	
1960[j]	275.6		1,050.0	—	1,050.0	
1961	310.8	...	1,220.0	—	1,220.0	...
1962	358.4	15.3	1,242.1	—	1,242.1	1.8
Iran[k]						
1957	141.5		268.3	—	268.3	...
1958	156.0	10.2	339.8	—	339.8	26.7
1960	280.0	...	860.0	—	860.0	...
1961	355.0	26.8	940.0	—	940.0	9.3
1962	490.0	38.1	1,000.0	—	1,000.0	6.4
Japan[i]						
1951	8,945.8		41,434.0	—	41,434.0	5.9
1956	13,081.8	7.4	62,500.0	—	62,500.0	14.5
1957	14,291.0	9.2	70,175.0	—	70,175.0	12.0
1958	15,777.0	10.4	74,615.0	—	74,615.0	6.3
1959	18,424.0	16.8	86,756.0	—	86,756.0	16.0
1960	20,649.0	12.2	101,700.0	—	101,700.0	17.0
1961	22,755.0	10.2	116,809.0	—	116,809.0	14.9
1962	25,503.0	12.1	124,019.0	—	124,019.0	6.2
Korea, Republic of						
1951	269.9		314.0	—	314.0	−23.0
1956	351.0	41.2	1,119.0	—	1,119.0	27.2
1957	366.4	4.4	1,324.8	—	1,324.8	18.3
1958	366.7	0.1	1,514.0	—	1,514.0	14.4
1959	374.8	2.2	1,688.5	—	1,688.5	11.5
1960	367.3	−2.0	1,699.4	—	1,699.4	0.6
1961	367.3	—	1,772.9	—	1,772.9	4.3
1962	434.0	18.2	1,978.1	—	1,978.5	11.6
Laos						
1951	2.0[l]		4.3[l]	—	4.3[l]	7.5
1956	1.4	−17.6	2.7	—	2.7	41.5
1957	1.5	7.1	3.4	—	3.4	25.8
1958	3.6	140.0	4.1	—	4.1	21.6
1959	3.6	—	5.8	—	5.8	41.5
1960	3.8	5.6	6.9	—	6.9	19.0
1961	4.6	21.0	8.0	—	8.0	16.0
1962	4.6	—	9.4	—	9.4	17.5
Malaysia:–						
Former Federation of Malaya						
1951	132.8	—	618.0	—	618.0	26.1
1956	236.2	−0.7	885.1	17.0[m]	902.1	8.6
1957	256.9	8.8	969.0	17.8[m]	986.8	9.3
1958	257.9	0.4	906.0	30.0[m]	936.1	−5.1
1959	307.0	19.0	831.5	40.7[m]	872.2	−6.8
1960	304.4	−0.8	1,085.9	48.4[m]	1,134.3	30.0
1961	315.3	3.6	1,238.5	55.2[m]	1,293.7	14.2
1962	304.6	−3.4	1,366.7	58.8[m]	1,425.5	10.2
North Borneo (Sabah)						
1951	1.8		—	...	...	...
1956	4.3	10.3	4.3	—	4.3	33.0
1957	4.2	−2.3	6.9	—	6.9	60.4
1958	5.8	38.1	8.5	—	8.5	23.5
1959	5.8	—	10.9	—	10.9	28.2
1960	9.2	5.9	15.0	—	15.0	37.6
1961	9.8	6.5	18.7	—	18.7	24.7
1962	9.2	−6.1	22.9	—	22.9	22.5

Table 1 B *(Continued)*

Public supply utilities

Country and year (1)	Installed generating capacity (thousand kW) (2)	Increase over previous year (percentage) (3)	Energy generation (million kWh): Public utility plants (4)	Purchased[b] (5)	Total (4)+(5)=(6) (6)	Increase over previous year (percentage) (7)
Sarawak						
1951	1.5		3.5	—	3.5	16.7
1956	5.0	20.8	9.9	—	9.9	21.0
1957	6.0	20.0	12.3	—	12.3	24.2
1958	6.3	5.0	14.1[n]	—	14.1[n]	-4.1
1959	8.1	28.6	15.9[n]	—	15.9[n]	13.0
1960	9.8	21.0	18.9[n]	—	18.9[n]	19.0
1961	11.1	13.2	23.6	—	23.6	24.9
1962	11.9	7.2	27.2	—	27.2	15.9
Singapore						
1951	37.0		208.6	—	208.6	11.7
1956	127.0	24.5	434.0	-17.0[o]	417.0	12.8
1957	127.0	—	496.9	-17.8[o]	479.1	15.0
1958	152.0	19.7	571.2	-30.0[o]	541.2	12.9
1959	152.0	—	616.1	-40.7[o]	575.4	6.2
1960	188.0	23.7	658.8	-48.4[o]	610.4	6.1
1961	188.0	—	719.6	-55.2[o]	644.4	8.9
1962	213.0	13.3	775.7	-58.8[o]	716.9	7.9
Mongolia[p]						
1957	35.7	...	84.4	—	84.4	...
1958	41.7	16.8	85.4	—	85.4	1.2
1959	49.4	18.5	95.0	—	95.0	11.2
1960	60.9	23.3	106.4	—	106.4	12.0
Nepal						
1951	3.6		6.2	—	6.2	3.2
1956	7.0	79.5	10.3	—	10.3	66.1
1957	7.0	—	12.7	—	12.7	23.2
1958	7.0	—	12.7	—	12.7	—
1959	5.6	-20.0	9.6	—	9.6	-24.5
1960	6.4	14.3	11.3	—	11.3	17.7
1961	6.4	—	10.9	—	10.9	-3.5
1962	7.3	14.1	12.6	—	12.6	15.6
New Zealand[l]						
1951	701.0	3.9	3,462.0	—	3,462.0	11.8
1956	1,205.0	2.8	4,967.0	—	4,967.0	4.6
1957	1,201.0	-0.3	5,644.0	—	5,644.0	13.6
1958	1,360.0	13.2	5,677.0	—	5,677.0	0.6
1959	1,509.0	10.9	6,361.0	—	6,361.0	12.0
1960	1,566.0	3.8	6,835.0	—	6,835.0	7.4
1961	1,815.0	15.9	7,399.0	—	7,399.0	8.3
1962	1,945.0	7.2	7,951.0	—	7,951.0	7.5
Pakistan						
1951	116.8		225.0	74.3	299.3	23.2
1956	244.3	22.1	821.2	17.0[q]	838.2	29.0
1957	267.3	9.4	940.0	22.0[q]	962.0	14.5
1958	276.6	3.0	1,225.4	—	1,225.4	27.4
1959	335.1	21.2	1,301.6	—	1,301.6	6.0
1960	657.8	96.3	1,449.9	—	1,449.9	11.4
1961	687.7	4.5	1,818.9	—	1,818.9	25.5
1962	838.8	22.0	2,307.5	—	2,307.5	26.9
Philippines						
1951	167.5		594.0	—	594.0	10.4
1956	376.6	29.0	1,279.9	—	1,279.9	18.8
1957	404.1	7.3	1,494.4	—	1,494.4	16.7
1958	424.2	5.0	1,756.1	—	1,756.1	17.6
1959	434.7	2.5	2,031.9	—	2,031.9	15.7
1960	596.5	37.3	2,259.5	—	2,259.5	11.2
1961	652.6	9.4	2,555.3	—	2,555.3	13.1
1962	661.1	1.3	3,010.1	—	3,010.1	17.8

Table 1 B *(Continued)*
Public supply utilities

Country and year (1)	Installed generating capacity (thousand kW) (2)	Increase over previous year (percentage) (3)	Energy generation (million kWh) Public utility plants (4)	Purchased[b] (5)	Total (4)+(5)=(6) (6)	Increase over previous year (percentage) (7)
Thailand						
1951[r]	42.7		104.8	—	104.8	...
1956[r]	135.7	26.1	328.1	—	328.1	13.7
1957[r]	141.7	4.4	373.9	—	373.9	13.9
1958[r]	150.4	6.1	408.1	—	408.1	9.2
1958	124.1		355.3	11.3	366.6	
1959	160.3	29.2	407.6	13.0	420.6	14.7
1960	177.6	10.8	501.5	14.2	515.7	22.6
1961	264.5	49.0	601.8	10.1	611.9	18.7
1962	273.2	3.3	700.3	8.9	709.2	15.9
Viet-Nam, Republic of						
1951	...	...	216.0	—	216.0	19.1
1956	75.6	1.5	212.5	—	212.5	4.9
1957	76.9	1.7	224.3	—	224.3	5.5
1958	83.8	9.0	244.4	—	244.4	9.0
1959	97.6	16.5	280.0	—	280.0	14.8
1960	98.5	9.2	304.0	—	304.0	8.6
1961	102.1	3.7	328.6	—	328.6	8.1
1962	115.5	13.1	374.9	—	374.9	14.1
Western Samoa						
1957	1.9	...	...	...	...	...
1958	1.9	—	...	...	...	...
1959	1.9	—	...	...	...	...
1960	1.9	—	4.4	—	4.4	...
1961	1.9	—	4.9	—	4.9	11.3
1962	1.9	—	5.7	—	5.7	16.3

[a] Figures relate to public supply utilities. Installed generating capacity of and energy produced and consumed for their own use by the self-supplying industrial plants and other particulars relating to industry are indicated in table 11.

[b] Including the energy purchased from self-supplying industrial plants in the country and the energy purchased from neighbouring countries, both for supply to public utility systems. The energy sold outside the country is indicated by negative sign.

[c] Relating to fiscal year ended 20 March of subsequent year and to power plants of installed capacity 100 kW and over, including self-supplying industrial plants.

[d] Relating to fiscal year ended 30 June of the specified year.

[e] Fiscal year ended September of specified year.

[f] Net generation, not including consumption by station auxiliaries.

[g] Sold to Pakistan.

[h] Covering three-month period from January to March 1957.

[i] Fiscal year ended March of subsequent year.

[j] Data incomplete.

[k] Fiscal year ended 20 March of subsequent year; 1956 and 1959 data not available; 1960, 1961 and 1962 data are only approximate.

[l] Approximate figures, including also power plants owned by mining industry.

[m] Purchased from Singapore.

[n] Relating to Sarawak Electricity Supply Co. Ltd. only.

[o] Sold to Federation of Malaya.

[p] No data available for other years. These figures are also included in table 1A. No further data on Mongolia are available for inclusion in other tables.

[q] Purchased from India.

[r] Including the installed capacity of and the energy produced and consumed for their own use by some self-supplying industrial plants.

Table 2a: Installed Capacity and Generation by Public Utility Supply, by Type of Plant, 1961 and 1962

A. ECAFE region[a]

Year and type of plant		Generating capacity		Generation	
		Thousand kW	Percentage of total	Million kWh	Percentage of total
1961	Steam	20,223.4	49.1	93,785.4	50.4
	Hdro-electric	19,509.3	47.4	89,388.2	48.1
	Diesel	1,458.7	3.5	2,338.3	1.3
	Energy purchased			391.8	0.2
	TOTAL	41,191.4	100.0	185,903.7	100.0
1962	Steam	23,016.1	50.1	109,799.7	54.8
	Hdro-electric	21,385.2	46.5	87,801.2	43.8
	Diesel	1,581.1	3.4	2,415.0	1.2
	Energy purchased			489.9	0.2
	TOTAL	45,982.4	100.0	200,505.8	100.0

[a] Excluding Mongolia owing to non-availability of data.

B. Individual countries

Country and year (1)	Generating capacity (thousand kW)				Generation (million kWh)				Energy purchased[a] (million kWh) (10)
	Steam (2)	Hydro-electric (3)	Diesel (4)	Total (5)	Steam (6)	Hydro-electric (7)	Diesel (8)	Total (9)	
Afghanistan[b]									
1961	5.0	48.0	6.0	59.0	2.0	116.0	5.0	123.0	—
1962	4.7	47.9	7.7	60.3	8.2	148.8	3.5	160.5	—
Australia[c]									
1961	4,922.0	1,522.0	221.0	6,665.0	19,293.0	4,662.0	[c]	23,955.0	—
1962	5,165.0	1,826.0	224.0	7,215.0	20,485.0	4,968.0	[c]	25,453.0	—
Brunei									
1961	—	—	3.2	3.2	—	—	7.5	7.5	2.8
1962	—	—	4.3	4.3	—	—	8.3	8.3	2.8
Burma[d]									
1961	57.7	84.5	48.7	190.9	43.7	182.3	61.3	287.3	—
1962	57.7	84.5	48.2	190.4	47.0	207.5	67.8	322.3	—
Cambodia									
1961	3.0	—	23.5	26.5	7.9	—	66.3	74.2	—
1962	3.0	—	31.1	34.1	8.2	—	74.1	82.3	—
Ceylon									
1961	12.0	55.5	26.7	94.2	1.5	277.2	32.4	311.1	—
1962	37.0	55.5	25.9	118.4	25.0	293.1	32.6	350.7	—
China (Taiwan)									
1961	380.5	538.0	4.9	923.4	1,730.2	2,355.3	6.3	4,071.8	11.9
1962	380.5	538.0	4.9	923.4	2,524.2	2,157.5	2.2	4,683.9	8.8
Hong Kong									
1961	365.0	—	0.2	365.2	1,542.1	—	0.3	1,542.4	—
1962	485.0	—	0.2	485.2	1,786.6	—	0.3	1,786.9	—
India[e]									
1961	2,466.0	2,234.1	316.8	5,016.9	9,475.8	9,814.4	379.7	19,669.9	367.0
1962	2,536.3	2,916.5	327.0	5,779.8	10,176.9	11,804.5	383.4	22,364.8	469.0
Indonesia									
1961	24.6	168.2	118.0	310.8	57.0	774.5	388.5	1,220.0	—
1962	45.8	170.9	141.7	358.4	72.6	777.3	392.2	1,242.1	—
Iran[f]									
1961	89.0	77.0	189.0	355.0	433.0	8.0	499.0	940.0	—
1962	89.0	207.0	194.0	490.0	360.0	100.0	540.0	1,000.0	—

Table 2a:

B. Individual countries *(Continued)*

Country and year (1)	Generating capacity (thousand kW) Steam (2)	Hydro-electric (3)	Diesel (4)	Total (5)	Generation (million kWh) Steam (6)	Hydro-electric (7)	Diesel (8)	Total (9)	Energy purchased[a] (million kWh) (10)
Japan[e]									
1961	10,146.0	12,575.0	34.0	22,755.0	54,313.0	62,426.0	70.0	116,809.0	—
1962	12,280.0	13,184.0	39.0	25,503.0	66,808.0	57,119.0	92.0	124,019.0	—
Korea, Republic of									
1961	222.5	143.5	1.3	367.3	1,118.3	652.5	2.1	1,772.9	—
1962	252.5	143.5	38.0	434.0	1,198.6	702.3	77.2	1,978.1	0.4
Laos[g]									
1961	—	—	4.6	4.6	—	—	8.0	8.0	—
1962	—	—	4.6	4.6	—	—	9.4	9.4	—
Malaysia									
Former Federation of Malaya									
1961	246.0	30.2	39.1	315.3	961.8	184.7	92.0	1,238.5	55.2[h]
1962	228.4	30.2	46.0	304.6	1,048.1	200.9	117.7	1,366.7	58.8[h]
North Borneo (Sabah)									
1961	—	—	9.8	9.8	—	—	18.7	18.7	—
1962	—	—	9.2	9.2	—	—	22.9	22.9	—
Sarawak									
1961	—	—	11.1	11.1	—	—	23.6	23.6	—
1962	—	—	11.9	11.9	—	—	27.2	27.2	—
Singapore									
1961	152.0[i]	—	36.0[j]	188.0	709.8	—	9.8	719.6	−55.2[k]
1962	177.0[i]	—	36.0[j]	213.0	771.8	—	3.9	775.7	−58.8[k]
Nepal									
1961	—	3.4	3.0	6.4	—	6.8	4.1	10.9	—
1962	—	3.4	3.9	7.3	—	7.0	5.6	12.6	—
New Zealand[e]									
1961	320.0	1,481.0	14.0	1,815.0	1,453.0	5,946.0	—	7,399.0	—
1962	391.0	1,548.0	6.0	1,945.0	1,172.0	6,779.0	—	7,951.0	—
Pakistan									
1961	340.0	253.4	94.3	687.7	797.8	800.8	220.3	1,818.9	—
1962	408.5	333.4	96.9	838.8	937.3	1,267.4	102.8	2,307.5	—
Philippines									
1961	288.1	290.3	74.2	652.6	1,232.2	1,186.8	136.3	2,555.2	—
1962	288.1	291.1	81.9	661.1	1,607.3	1,246.5	156.3	3,010.1	—
Thailand									
1961	135.0	—	129.5	264.5	396.6	—	205.2	601.8	10.1
1962	137.6	—	135.6	273.2	544.8	—	155.5	700.3	8.9
Viet-Nam, Republic of									
1961	49.0	3.9	49.2	102.1	216.7	10.0	101.9	328.6	—
1962	49.0	4.0	62.5	115.5	218.1	17.5	139.3	374.9	—
Western Samoa									
1961	—	1.3	0.6	1.9	—	4.9	[l]	4.9	—
1962	—	1.3	0.6	1.9	—	4.9	0.8	5.7	—

[a] Including the energy purchased from self-supplying industrial plants in the country and the energy purchased from neighbouring countries, both for supply to public utility systems. The energy sold outside the country is indicated by negative sign.

[b] Relating to fiscal year ended 20 March of subsequent year and to power stations of capacity 100 kW and over, including self-supplying industrial plants.

[c] Relating to fiscal year ended 30 June of the specified year; the generation of diesel plants is included in the generation of steam plant in column (6).

[d] Relating to fiscal year ended 30 September of specified year.

[e] Relating to fiscal year ended 31 March of subsequent year.

[f] Relating to fiscal year ended 20 March of subsequent year.

[g] Including gas engine stations of 200 kW installed capacity generating 375,000 kWh in the year 1961 and 400,000 kWh in the year 1962.

[h] Purchased from Singapore.

[i] Including a 2 MW standby open cycle gas turbo-alternator house set.

[j] Free piston gas turbine set at St. James' power station running on experiment.

[k] Sold to the Federation of Malaya.

[l] Included in column (7).

Table 2b: INSTALLED CAPACITY AND GENERATION OF PUBLIC UTILITY SUPPLY, BY OWNERSHIP, 1961 AND 1962

	Installed generating capacity (thousand kW)			*Generation (million kWh)*		
Country and year (1)	*Private companies (2)*	*Government (including public corporations, municipalities) (3)*	*Total (4)*	*Private companies (5)*	*Government (including public corporations, municipalities) (6)*	*Total (7)*
ECAFE region[a]						
1961 (21 countries) . . .	25,903.0	14,933.4	40,836.4	151,522.6	33,049.3	184,571.9
percentage of total	63.4	36.6	100	82.1	17.9	100
1962 (21 countries) . . .	29,059.5	16,432.9	45,492.4	161,607.3	37,408.6	199,015.9
percentage of total	63.8	36.2	100	81.2	18.8	100
Afghanistan[b]						
1961	11.0	48.0	59.0	16.0	107.0	123.0
1962	11.0	49.3	60.3	22.0	138.5	160.5
Australia[c]						
1961	366.0	6,299.0	6,665.0	22,744.0	1,211.0	23,955.0
1962	367.0	6,848.0	7,215.0	24,265.0	1,188.0	25,453.0
Brunei						
1961	—	3.2	3.2	—	7.5	7.5
1962	—	4.3	4.3	—	8.3	8.3
Burma[d]						
1961	—	190.9	190.9	—	287.3	287.3
1962	—	190.4	190.4	—	322.3	322.3
Cambodia						
1961	2.0	24.5	26.5	1.6	72.6	74.2
1962	1.6	32.5	34.1	2.4	79.9	82.3
Ceylon						
1961	—	94.2	94.2	—	311.1	311.1
1962	—	118.4	118.4	—	350.7	350.7
China (Taiwan)						
1961	[e]	923.4	923.4	...	4,071.8	4,071.8
1962	[e]	923.4	923.4	...	4,683.9	4,683.9
Hong Kong						
1961	365.2	—	365.2	1,542.4	—	1,542.4
1962	485.2	—	485.2	1,786.9	—	1,786.9
India[f]						
1961	1,340.2	3,676.7	5,016.9	5,941.6	13,728.3	19,669.9
1962	1,475.0	4,304.8	5,779.8	6,294.6	16,070.2	22,364.8
Indonesia						
1961	—	310.8	310.8	—	1,220.0	1,220.0
1962	[g]	358.4	358.4	—	1,242.1	1,242.1
Japan[f]						
1961	22,755.0	—	22,755.0	116,809.0	—	116,809.9
1962	25,503.0	—	25,503.0	124,019.0	—	124,019.0
Korea, Republic of						
1961	367.3	—	367.3	1,772.9	—	1,772.9
1962	434.0	—	434.0	1,978.1	—	1,978.1
Laos						
1961	[h]	4.6	4.6	...	8.0	8.0
1962	—	4.6	4.6	—	9.4	9.4
Malaysia						
Former Federation of Malaya						
1961	112.4	202.9	315.3	522.4	716.1	1,238.5
1962	112.4	192.2	304.6	562.4	804.3	1,366.7
North Borneo (Sabah)						
1961	0.1	9.7	9.8	0.2	18.5	18.7
1962	—	9.2	9.2	—	22.9	22.9

Table 2b *(Continued)*

Country and year (1)	Installed generating capacity (thousand kW) Private companies (2)	Government (including public corporations, municipalities) (3)	Total (4)	Generation (million kWh) Private companies (5)	Government (including public corporations, municipalities) (6)	Total (7)
Sarawak						
1961	0.6	10.5	11.1	0.6	23.0	23.6
1962	0.6	11.3	11.9	0.6	26.6	27.2
Singapore						
1961	—	188.0	188.0	—	719.6	719.6
1962	—	213.0	213.0	—	775.7	775.7
Nepal						
1961	2.0	4.4	6.4	1.6	9.3	10.9
1962	2.0	5.3	7.3	1.4	11.2	12.6
New Zealand[f]						
1961	[i]	1,815.0	1,815.0	[i]	7,399.0	7,399.0
1962	[i]	1,945.0	1,945.0	[i]	7,951.0	7,951.0
Pakistan						
1961	102.6	585.1	687.7	422.6	1,396.3	1,818.9
1962	171.7	667.1	838.8	494.4	1,813.1	2,307.5
Philippines						
1961	369.7	282.9	652.6	1,411.9	1,143.4	2,555.3
1962	376.7	284.4	661.1	1,810.6	1,199.5	3,010.1
Thailand						
1961	13.6	250.9	264.5	18.2	583.6	601.8
1962	14.3	258.9	273.2	18.4	681.9	700.3
Viet-Nam, Republic of						
1961	95.3	6.8	102.1	317.6	11.0	328.6
1962	105.0	10.5	115.5	351.5	23.4	374.9
Western Samoa						
1961	—	1.9	1.9	—	4.9	4.9
1962	—	1.9	1.9	—	5.7	5.7

[a] Excluding Iran and Mongolia owing to non-availability of data.

[b] Relating to fiscal year ended 20 March of subsequent year and to power stations of installed capacity of 100 kW and over, including self-supplying industrial plants.

[c] Relating to fiscal year ended 30 June of the specified year.

[d] Relating to fiscal year ended 30 September of the specified year.

[e] Small installations totalling 576 kW for the year 1961 and 625 kW for 1962; these figures are not included either in this table or in others.

[f] Relating to fiscal year ended 31 March of subsequent year.

[g] Installed capacity of 5,800 kW pertaining to private companies, this figure is not included either in this table or in others.

[h] Installed capacity of 1,200 kW pertaining to private companies, this figure is not included either in this table or in others.

[i] Virtually all installed capacity and generation belongs to the Government; the installed capacity of private companies decreased from 6,000 kW in fiscal year 1950 to 1,000 kW in 1962 and similarly generation decreased from 35 million kWh in 1950 to 6 million kWh in fiscal year 1962.

Table 2c: INSTALLED CAPACITY AND GENERATION OF PUBLIC UTILITY POWER STATIONS HAVING A CAPACITY OF 10 MW AND ABOVE, 1961 AND 1962[a]

		Installed generating capacity (MW)				Generation (million kWh)			
		Hydro-electric		Thermal		Hydro-electric		Thermal	
Country (1)	Name and location of station (2)	1961 (3)	1962 (4)	1961 (5)	1962 (6)	1961 (7)	1962 (8)	1961 (9)	1962 (10)
Afghanistan[b]	Sarobi	22.0	22.0			88.0	110.0		
Burma[c]	Ywama, Insein			20.0	20.0			4.1	6.6
	Ahlone[d], Rangoon			40.0	40.0			37.0	37.7
	Bhalu Chaung hydro-electric, Lawpita	84.0	84.0			180.0	205.6		
Cambodia	Phnom-Penh[e]			17.1	25.0			61.3	68.7
Ceylon	Laksapana	50.0	50.0			268.0	283.6		
	Grandpas[f]				25.0				7.8
China (Taiwan)	Takwan	100.0	100.0			629.7	499.4		
	Kukuan	90.0	90.0			6.1	22.5		
	Tienlun	79.5	79.5			339.5	366.2		
	Lungchien	48.6	48.6			150.9	131.6		
	Chukung	43.5	43.5			264.3	210.8		
	Liwu	32.0	32.0			151.1	142.4		
	Wulai	22.5	22.5			111.9	120.7		
	Tungmen	21.0	21.0			137.8	140.1		
	Wusheh	20.7	20.7			105.4	89.4		
	Yuanshan	16.3	16.3			73.4	80.6		
	Wanta	15.2	15.2			71.8	63.1		
	Shinkweishan	13.0	13.0			74.0	77.9		
	Shenao			200.0	200.0			577.1	1,468.5
	Nanpu			80.0	80.0			569.8	524.3
	Peipu			75.0	75.0			498.5	480.6
	Kaohsiung			13.0	13.0			48.9	24.9
	Sunshan			10.5	10.5			28.3	17.1
Hong Kong	North Point, Hong Kong Island			182.5	182.5			530.1	596.3
	Kowloon			182.5	302.5			1,012.0	1,190.3
India[g]	*Andhra Pradesh*								
	Hussainsagar			22.3	24.2			73.0	83.0
	Vijaywada			12.0	12.0			12.0	7.0
	Ramagundam			37.5	37.5			133.0	104.2
	Nizamsagar	15.1	15.1			50.9	52.2		
	Machkund	120.4	114.8			596.9	614.3		
	Tunga Bhadra								
	(a) Right bank dam power house	18.0	18.0			100.3	91.8		
	(b) Hampi	18.0	18.0			100.6	101.2		
	Bihar								
	D.V.C.								
	(a) Panchet	40.0	40.0			153.3	128.8		
	(b) Bokaro			255.0	255.0			1,188.6	1,466.6
	Patna			13.5	13.5			28.8	16.5
	Sijua			15.0	15.0			82.8	78.5
	Gujarat								
	Seeka			16.0	16.0			62.0	65.1
	Porbander			15.0	15.0			52.9	59.1
	Utran			67.5	67.5			260.3	311.6
	Bhavnagar			11.6	11.6			31.7	41.8
	Ahmedabad								
	'A' P.H.			37.5	37.5				
	'B' P.H.			60.0	60.0			870.2	944.8
	'C' P.H.			90.0	90.0				
	Rajkot diesel				10.3				24.8
	Kerala								
	Poringalkothu	32.0	32.0			162.7	166.1		
	Pallivasal	37.5	37.5			226.6	217.9		
	Sengulam	48.0	48.0			131.6	155.1		
	Narimanglam	30.0	30.0			173.1	169.9		

Table 2c (Continued)

Country (1)	Name and location of station (2)	Installed generating capacity (MW) — Hydro-electric 1961 (3)	Hydro-electric 1962 (4)	Thermal 1961 (5)	Thermal 1962 (6)	Generation (million kWh) — Hydro-electric 1961 (7)	Hydro-electric 1962 (8)	Thermal 1961 (9)	Thermal 1962 (10)
India (*Ctd.*)	*Madhya Pradesh*								
	Indore			18.1	18.1			12.3	4.0
	Korba			90.0	90.0			326.4	351.7
	Nepanagar			17.0	17.0			71.8	76.1
	Gandhisagar	69.0	69.0			136.7	263.1		
	Jabalpore			13.3	13.3			57.3	63.2
	Madras								
	Madurai			14.0	14.0			60.0	63.3
	Basin Bridge								
	'A' P.H.			72.5	72.5			354.6	391.9
	'B' P.H.			15.0	15.0				
	Papanasam	28.0	28.0			76.5	127.5		
	Mettur	40.0	40.0			258.1	261.2		
	Moyar	36.0	36.0			174.0	188.1		
	Canada P.H. No. I	40.0	40.0			169.6	114.2		
	Canada P.H. No. II	140.0	140.0				423.2		
	Periyar	105.0	105.0			668.2	610.0		
	Singara (Pykara)	65.9	65.9			404.8	435.7		
	Maharashtra								
	Tata hydro-thermal	276.0	276.0			1,510.4			1,037.1
	,, ,,			187.5	187.5		1,369.6	h	
	Ballarshah			22.5	22.5			61.4	56.0
	Paras			30.0	30.0			96.2	154.2
	Khapper Kheda			60.0	60.0			248.3	238.9
	Chola (Kalyan)			136.0	136.0			443.4	391.9
	Koyna		242.0				660.9		
	Jammu & Kashmir								
	Mohora		12.2				...		
	Ganderbal		15.0				57.6		
	Mysore								
	(a) Simshapur	16.2	16.2			104.1	105.4		
	(b) Shivasamundram	42.0	42.0			122.1	184.8		
	(c) Mahatma Gandhi (Jog)	120.0	120.0			787.8	805.6		
	Munirabad		18.0				42.9		
	Orissa								
	Hirakud dam No. I	123.0	160.5			595.0	827.2		
	Hirakud No. II (Chiplima P.H.)		48.0				—		
	Punjab								
	Jonginder Nagar	48.5	48.5			191.5	172.8		
	Ganguwal	77.0	77.3						
	Kotla	77.0	77.3			1,646.9	2,186.5		
	Bhakra P.H. (Left bank)	265.0	450.0						
	Rajasthan								
	Jaipur			15.5	15.5			49.3	28.6
	Jodhpur			10.5	10.5			28.0	13.0
	Uttar Pradesh								
	Mahamudpur	10.5	10.5			62.0	62.0		
	Pallini	20.4	20.4			129.3	129.3		
	Khatima	41.4	41.4			227.0	229.1		
	Mainpuri			10.0	10.0			33.9	33.8
	Harduaganj			20.0	20.0			45.4	34.2
	New Harduaganj				60.00				—
	Mau			15.0	15.0			28.0	34.0
	Gorakhpur			18.1	15.0			36.0	44.0
	Faizabad (Sohwal)			19.6	19.6			24.0	32.6
	Kanpur			91.5	106.5			327.0	358.8
	Rihand	250.0	250.0			—	479.9		
	Agra			19.7	19.7			66.6	62.4
	Allahabad			14.5	14.0			58.4	48.7
	Benaras			14.5	14.5			59.3	51.3
	Lucknow			18.5	18.5			72.1	73.8

Table 2c *(Continued)*

Country (1)	Name and location of station (2)	Installed generating capacity (MW) Hydro-electric 1961 (3)	Hydro-electric 1962 (4)	Thermal 1961 (5)	Thermal 1962 (6)	Generation (million kWh) Hydro-electric 1961 (7)	Hydro-electric 1962 (8)	Thermal 1961 (9)	Thermal 1962 (10)
India *(Ctd.)*	*West Bengal*								
	Durgapur (D.V.C.)			165.0	165.0			591.9	851.3
	Maithon (D.V.C.)	60.0	60.0			130.9	158.7		
	Dishergarh			16.0	16.0			56.0	49.4
	Gourepore			45.0	45.0			159.6	163.5
	Calcutta E.S. Company								
	(a) Cossipore			67.0	67.0				
	(b) Mulajore			151.0	151.0			1,666.2	1,841.6
	(c) New Cossipore			122.5	122.5				
	(d) Southern			111.3	111.3				
	Union Territories								
	Delhi			53.6	55.6			267.3	225.9
Indonesia	Mendalan, East Java	23.0	23.0			105.4	75.4		
	Siman	10.8	10.8			49.4	55.4		
	Djelok, Central Java	16.0	16.0			50.0	90.4		
	Timo, Central Java		12.0				2.0		
	Kratjak, West Java	16.5	16.5			54.7	65.9		
	Ubrug „	19.0	19.0			52.5	57.6		
	Lamadjan, „	19.5	19.5			71.7	78.2		
	Tjikalong, „	19.5	19.5			59.0	74.7		
	Parakanhondang	11.0	11.0			46.1	55.2		
	Gambir steam, Djakarta			14.0	14.0			33.8	33.8
	Tandjung Priok, Djakarta				25.0				39.2
	Antjol diesel, Djakarta			12.5	12.5			50.7	34.9
	Karet diesel, „			12.5	12.5			48.7	32.9
	Kebajoran diesel, „			15.0	15.0			6.2	47.8
Iran[b]	Tarasht, Teheran			50.0	50.0			158.0	117.0
	Jahleh, Teheran			24.0	24.0			85.0	83.0
	Isfahan			10.0	10.0			55.0	53.0
	Karadj	75.0	75.0			3.0[i]	88.0[i]		
	Dez		130.0						
Japan[g, j]	*Hokkaido E.P. Co., Ltd.*								
	Uryu	51.0	51.0			188.6	212.1		
	Tohoku E.P. Co., Ltd.								
	Takuwa	60.0	60.0			300	268.5		
	Hon-na	78.0	78.0			391	335.5		
	Uwada	63.9	63.9			330	274.0		
	Miyashita	64.2	64.2			431	366.4		
	Yanaizu	50.0	75.0			318	266.4		
	Shingo	51.6	51.6			374	313.8		
	Kaminojiri	52.0	52.0			321	266.0		
	Toyomi	56.4	56.4			419	361.8		
	Tokyo E.P. Co., Ltd.								
	Saku	72.7	72.7			438	373.3		
	Akimoto	93.6	93.6			153	133.4		
	Inawashiro No. 1	53.5	53.5			226	190.9		
	Shinanogawa	165.0	165.0			1,257	1,123.7		
	Chubu E.P. Co., Ltd.								
	Hatanagi No. 2	85.0	85.0			101.4	209.5		
	Ikawa	62.0	62.0			185.3	135.2		
	Okuizumi	87.0	87.0			387.8	332.2		
	Oh-igawa	68.2	68.2			385.6	348.4		
	Kawaguchi	58.0	58.0			306.3	298.0		
	Yasuoka	52.5	52.5			196.8	167.4		
	Hiraoka	75.0	75.0			353.1	304.1		
	Hatanaki No. 1		137.0				1,114.6		
	Hokuriku E.P. Co., Ltd.								
	Jintsugawa No. 1	80.0	80.0			507.5	382.4		
	Wadagawa No. 2	122.0	122.0			405.1	388.8		
	Shin Nakachiyama	73.0	73.0			276.6	254.6		

Table 2c *(Continued)*

Country (1)	Name and location of station (2)	Installed generating capacity (MW): Hydro-electric 1961 (3)	Hydro-electric 1962 (4)	Thermal 1961 (5)	Thermal 1962 (6)	Generation (million kWh): Hydro-electric 1961 (7)	Hydro-electric 1962 (8)	Thermal 1961 (9)	Thermal 1962 (10)
Japan *(Ctd.)*	*Kansai E.P. Co., Ltd.*								
	Kurobegawa No. 4	160.0	234.0			721.2	633.7		
	Kurobegawa No. 3	81.0	81.0			486.7	390.8		
	Kurobegawa No. 2	72.0	72.0			449.9	373.2		
	Yanagawara	54.0	54.0			352.3	337.3		
	Soyama	54.0	54.0			375.6	286.4		
	Komaki	72.0	72.0			500.6	375.8		
	Kanidera	50.0	50.0			367.3	245.7		
	Ontake	66.0	66.0			342.1	299.4		
	Yomikaki No. 2	70.0	70.0			379.3	357.5		
	Maruyama	125.0	125.0			542.4	498.7		
	Chugoku E.P. Co., Ltd.								
	Takiyamagawa	51.5	51.5			170.8	192.2		
	Kyushu E.P. Co., Ltd.								
	Kamishiiba	90.0	90.0			223.0	233.0		
	Tsukabaru	60.0	60.0			226.0	211.0		
	Iwayado	50.0	50.0			161.0	159.0		
	Morozuka	50.0	50.0			127.0	119.0		
	Oh-yodogawa No. 1	50.0	55.0			140.0	156.0		
	Electrc Power Dev. Co., Ltd.								
	Sakuma	350.0	350.0			1,291.9	1,023.3		
	Tagokura	380.0	380.0			621.5	527.0		
	Kuromatagawa No. 1	61.5	61.5			294.2	247.9		
	Okutadami	360.0	360.0			525.8	496.2		
	Miboro	215.0	215.0			626.1	404.0		
	Totsugawa No. 1	75.0	75.0			376.5	295.9		
	Totsugawa No. 2	58.0	58.0			34.0	268.0		
	Taki	92.0	92.0			111.6	300.7		
	Futamata		70.6				8.2		
	Tokushima Ken								
	Hinotani	61.0	61.0			319.2	229.9		
	Hokkaido E.P. Co., Ltd.								
	Takigawa			225.0	225.0			1,282.6	1,273.3
	Sunagawa			124.0	124.0			473.0	260.9
	Ebetsu			70.0	170.0			103.0	240.4
	Tohoku E.P. Co., Ltd.								
	Hachinohe			150.0	150.0			743.2	695.4
	Sendai			350.0	525.0			2,183.2	2,997.1
	Tokyo E.P. Co., Ltd.								
	Senju			77.5	77.5			163.4	95.8
	Ushioda			130.0	130.0			470.4	358.8
	Tsurumi			517.5	517.5			2,407.7	2,036.9
	Shin Tokyo			482.0	482.0			2,777.7	2,639.3
	Chiba			600.0	600.0			4,128.2	4,109.5
	Shinagawa			375.0	375.0			2,022.8	2,469.2
	Yokosuka			265.0	530.0			1,717.6	3,126.3
	Kawasaki			525.0	525.0			2,340.7	3,739.5
	Yokohama				350.0				1,965.3
	Chubu E.P. Co., Ltd.								
	Meiko			285.0	285.0			1,409.6	1,377.6
	Nagoya			140.0	140.0			485.8	476.1
	Mie			341.0	341.0			1,807.3	2,254.4
	Shin Nagoya			596.0	816.0			4,215.9	5,505.4
	Kansai E.P. Co., Ltd								
	Tanagawa			150.0	306.0			1,012.7	1,503.2
	Osaka			624.0	624.0			4,294.6	4,631.0
	Kizugawa			63.0	63.0			225.3	268.7
	Amagasaki Higashi			140.0	140.0			290.7	399.6
	Amagasaki No. 1			318.0	318.0			1,489.9	1,630.5
	Amagasaki No. 2			366.0	366.0			2,002.2	2,250.4
	Amagasaki No. 3				150.0				613.1
	Himeji No. 1			266.0	422.0			1,856.6	2,830.5
	Shikamako			75.0	75.0			381.6	351.3

Table 2c *(Continued)*

Country (1)	Name and location of station (2)	*Installed generating capacity (MW)* Hydro-electric 1961 (3)	Hydro-electric 1962 (4)	Thermal 1961 (5)	Thermal 1962 (6)	*Generation (million kWh)* Hydro-electric 1961 (7)	Hydro-electric 1962 (8)	Thermal 1961 (9)	Thermal 1962 (10)
Japan *(Ctd.)*	*Chugoku E.P. Co., Ltd.*								
	Samban			76.5	76.5			272.6	190.3
	Saka			158.2	158.2			976.6	830.7
	Ube			60.0	60.0			184.5	104.7
	Shine Ube			150.0	306.0			1,031.8	1,954.6
	Onoda			130.0	130.0			550.8	290.2
	Mizushima			125.0	125.0			444.6	866.4
	Shikoku E.P. Co., Ltd								
	Matsuyama			141.0	141.0			696.2	888.6
	Saijo			62.0	62.0			164.3	276.4
	Kyushu E.P. Co., Ltd.								
	Kokura			81.0	81.0			64.2	7.2
	Tobata			54.0	54.0			111.8	24.1
	Karita			387.0	387.0			2,730.2	2,618.6
	Chikujo			145.0	145.0			775.7	420.6
	Shin Minato			156.0	156.0			1,109.4	988.6
	Minato			76.0	76.0			16.9	3.9
	Minato No. 2			108.0	108.0			401.4	319.5
	Ainoura			174.5	174.5			724.4	549.4
	Ohmura			66.0	66.0			474.4	423.5
	Shin Kokura			156.0	312.0			604.1	1,583.1
	Sumitomo Kyodo E.P. Co., Ltd.								
	Niihama Nishi			75.0	150.0			426.1	935.1
	Niihama Higashi			60.0	60.0			128.5	128.3
	Joban Kyodo Thermal P. Co., Ltd.								
	Nakoso			295.0	295.0			1,724.8	1,892.2
	Shimizu Kyodo Thermal Power Co., Ltd.								
	Shimizu				150.0				608.4
Korea, Republic of	Yongwol, Kangwon			100.0	100.0			378.7	276.8
	Tanginri (No. 1, 2) Seoul . . .			22.5	22.5			27.4	56.1
	Tanginri (No. 3)			25.0	25.0			178.6	183.4
	Masan, Kyungnam			50.0	50.0			358.1	333.8
	Samchuk, Kangwon			25.0	25.0			175.5	175.6
	Power barge, Pusan				30.0				181.9
	Wangssipri diesel, Seoul				18.8				46.1
	Kwangju diesel, Junnam				11.8				1.6
	Hwachon, Kangwon	81.0	81.0			339.5	390.5		
	Chongpyong, Kyungki	39.6	39.6			192.6	218.0		
	Chilbo, Junnam	14.4	14.4			73.7	57.9		
Malaysia:	Connaught Bridge								
Former Fed.	Port Swettenham, Selangor . . .			80.0	80.0			449.2	480.2
of Malaya	Malacca			30.0	30.0			84.6	111.8
	Bungsar[k], Kuala Lumpur . . .			22.5	10.0			3.2	15.7
	Penang Municipal station, Penang			30.0	30.0			90.5	83.7
	Malim Nawar, Perak			54.0	54.0			247.1	258.8
	Batu Gajah, Perak			24.5	24.5			87.2	97.8
	Chenderoh, Perak	27.0	27.0			170.7	186.6		
Singapore	Pasir Panjang			152.0	177.0			709.8	771.8
	St. James Power Station			36.0	36.0			9.8	3.9
New Zealand[g]	Waikaremoana	124.0	...			...	...		
North Island	King's Wharf			27.0	...			0.1	...
	Meremere			180.0	...			953.9	402.6
	Karapiro	90.0	...			424.8	530.6		
	Arapuni	157.8	...			665.2	967.4		
	Waipapa	51.0	...			190.4	262.7		
	Maraetai	180.0	...			702.5	906.3		
	Whakamaru	100.0	...			394.3	480.6		
	Atiamuri	63.0	...			234.6	294.7		
	Ohakuri	112.0	...			311.5	354.0		

Table 2c *(Continued)*

Country (1)	Name and location of station (2)	Installed generating capacity (MW) — Hydro-electric 1961 (3)	Installed generating capacity (MW) — Hydro-electric 1962 (4)	Installed generating capacity (MW) — Thermal 1961 (5)	Installed generating capacity (MW) — Thermal 1962 (6)	Generation (million kWh) — Hydro-electric 1961 (7)	Generation (million kWh) — Hydro-electric 1962 (8)	Generation (million kWh) — Thermal 1961 (9)	Generation (million kWh) — Thermal 1962 (10)
New Zealand[g] (*Ctd.*)									
North Island	Wairakei			91.2	...			491.4	761.4
	Kaitawa	...	...			150.6	104.2		
	Tuai	...	...			287.7	209.0		
	Piripaua	...	...			178.8	130.6		
	Mangahao	19.2	...			79.2	51.9		
	Evans Bay			22.0	...			0.05	0.1
South Island	Cobb	32.0	...			127.0	129.0		
	Highbank	25.2	...			105.0	88.2		
	Coleridge	34.5	...			123.4	114.8		
	Tekapo	25.2	...			80.2	94.3		
	Waitaki	105.0	...			441.0	424.7		
	Roxburgh	280.0	...			1,094.5	1,233.9		
	Dunedin	44.6	...			150.9	...		
Pakistan	Chichoki, Mallian, Shiekupura	...	13.2			...	47.0		
West Pakistan	Dargai, Malakand Agency	...	20.0			...	127.9		
	Hyderabad			...	20.7			...	57.3
	Karachi Electric Supply Corporation, Karachi			...	139.8			...	415.7
	Lyallpur			...	14.0			...	10.8
	Malakand (Jabban)	...	19.6				118.0		
	Multan (Piranghaib)			...	135.7			...	278.7
	Rasul, Jhelum	...	22.0			...	105.2		
	Shadiwal, Gujrat	...	13.5			...	42.3		
	Shahdra, Shiekupura			...	17.5			...	...
	Warsak	...	160.0			...	626.4		
East Pakistan	Chittagong diesel (New Mooring)			...	10.7			...	20.7
	Goalpara, Khulna			...	26.4			...	39.5
	Karnafuli	...	80.0			...	176.4		
	Sidhirganj, Dacca			...	48.4			...	62.9
Philippines	Rockwell			245.0	245.0			1,184.8	
	Makati, Rizal								1,564.1
	Blaisdell, Manila			34.5	34.5			12.6	
	VisayanElectric Co.,[1] Cebu			13.6	13.6			47.3	53.9
	Binga, Itogon, Mt. Province	100.0	100.0			406.8	405.9		
	Ambuklao, Boked, Mt. Province	75.0	75.0			328.9	324.8		
	Maria Cristina, Illigan City	50.0	50.0			182.7	198.9		
	Caliraya—Lumot, Lumban, Laguna	36.0	36.0			146.0	188.4		
	Botocan, Luisiana, Laguna	17.0	17.0			53.3	58.3		
Thailand	North Bangkok			75.0	75.0			260.0	461.9
	Wat Lieb, Bangkok			21.0	23.6			49.2	3.1
	Samsen[m], Bangkok			31.5	31.5			48.3	33.2
	Lumpini diesel, Bangkok			23.7	22.5			55.8	21.2
	Mae Moh, Lampang			12.5	12.5			41.7	49.4
Viet-Nam, Republic of	Choquan, Saigon			49.0	49.0			216.7	218.1
	Ch-Lon diesel				20.7				65.3

[a] No public utility power station of capacity of 10 MW and above in Brunei, Laos, North Borneo (Sabah) and Sarawak, Nepal and Western Samoa.
No data available for Australia and Mongolia.

[b] Relating to fiscal year ended 20 March of subsequent year.

[c] Relating to fiscal year ended 30 September of the specified year.

[d] A combined steam-diesel station, steam 35 MW and diesel 5 MW; the generation figures for both years relate only to the 35 MW steam plant.

[e] A combined steam-diesel station, steam 3.0 MW for both years, the balance being diesel.

[f] In operation for only one month.

[g] Relating to fiscal year ended 31 March of subsequent year.

[h] Included in column (7).

[i] Only test operation.

[j] All power plants listed for Japan have a capacity of 50 MW or more.

[k] Being maintained as an emergency standby station.

[l] A combined steam-diesel station, steam 8.6 MW and diesel 5 MW.

[m] A combined steam-diesel station, steam 26.5 MW and diesel 5 MW.

Table 3: FUEL CONSUMPTION IN PUBLIC UTILITY THERMAL POWER STATIONS 1961 AND 1962

A. *Steam power stations*[a]

Fuel in terms of coal equivalent

Country and year (1)	Fuel consumption in terms of coal equivalent: Kind of fuel used (2)	Total coal equivalent[b] (thousand kg) (3)	kg per kWh generated (4)	Generation (million kWh) (5)
Burma[c]				
1961	Coal, furnace oil and petroleum . . . . . . (coal 6,810 kcal per kg)	42,485	0.97	43.7
1962	Coal and furnace oil . . . . (coal 6,790 kcal per kg)	50,180	1.06	47.3
Cambodia				
1962	Furnace oil	8,940	1.09	8.2
China (Taiwan)				
1961	Coal	929,000	0.54	1,730.0
1962	Coal	1,207,000	0.48	2,524.0
Hong Kong				
1961	Coal and furnace oil	864,184	0.56	1,542.1
1962	Coal, furnace oil and natural gas	964,621	0.54	1,786.6
India[d]				
1961	Coal, furnace oil and natural gas	7,236,361	0.76	9,475.8
1962	Coal and furnace oil	7,995,689	0.79	10,176.9
Indonesia				
1962	Coal and furnace oil	102,950	1.42	72.6
Japan[d]				
1961	Coal, furnace oil and natural gas	26,235,860	0.48	54,334.0
1962	Coal, furnace oil and natural gas	28,621,765	0.43	66,808.0
Korea, Republic of				
1961	Coal and furnace oil	873,671	0.80	1,090.9
1962	Coal and furnace oil	950,226	0.79	1,198.6
Malaysia:				
Former Federation of Malaya				
1961	Coal and furnace oil	696,163	0.72	961.8
1962	Coal	762,324	0.73	1,048.1
Singapore				
1961	Furnace oil	344,000	0.48	709.8
1962	Furnace oil	382,000	0.49	775.7
New Zealand[d,e]				
1962	Coal	268,000	0.67	402.6
Pakistan				
1961	Coal, gas and furnace oil	547,000	0.69	797.8
1962	Coal, gas and furnace oil	575,800	0.61	937.3
Philippines				
1961	Coal and furnace oil	537,600	0.44	1,232.2
1962	Coal and furnace oil	613,613	0.39	1,581.2
Thailand				
1961	Fuel oil, lignite, coal, charcoal, firewood, paddy husk and briquette saw dust . . .	244,429	0.62	396.6
1962	Fuel oil and lignite	248,770	0.46	544.8
Viet-Nam, Republic of				
1961	Coal and furnace oil	166,510	0.77	216.7
1962	Coal and furnace oil	181,261	0.83	218.1

[a] No data available for Afghanistan, Australia, Cambodia, Iran and Mongolia.

In Ceylon, the two steam stations at Colombo were maintained only as standby and the 25 MW thermal station at Grandpas was operated only for one month in late 1962.

No public utility steam power station were in operation in Brunei, Laos, North Borneo (Sabah) and Sarawak, Nepal and Western Samoa.

No 1961 data for Indonesia and New Zealand.

[b] Based on assumed calorific values of different fuels.

[c] Relating to fiscal year ended 30 September of the specified year.

[d] Relating to fiscal year ended 31 March of the subsequent year.

[e] Relating only to Meremere power station.

Table 3 *(Continued)*

B. *Diesel power stations*[a]

Country and year (1)	Fuel consumption: Kind of fuel (2)	Total consumption (thousand kg) (3)	kg per kWh generated (4)	Generation (million kWh) (5)
Brunei				
1961	Diesel and light diesel oil	1,908	0.26	7.5
1962	Diesel and light diesel oil	2,050	0.25	8.3
Burma[b]				
1961	Diesel and light diesel oil	20,671	0.34	61.3
1962	Diesel and light diesel oil (10,850 kcal per kg)	22,223	0.33	67.8
Cambodia				
1962	Diesel and light diesel oil	24,742	0.85	65.0
Ceylon[c]				
1961	Diesel and light diesel oil	2,112	0.23	9.0
1962	Diesel and light diesel oil	2,509	0.24	10.5
China (Taiwan)				
1961	Diesel and light diesel oil	1,972	0.31	6.3
1962	Diesel and light diesel oil	738	0.33	2.2
India[d]				
1961	Diesel and light diesel oil	118,184	0.31	379.7
1962	Diesel and light diesel oil	119,470	0.31	383.4
Indonesia				
1961	Diesel and light diesel oil	125,168	0.32	388.5
1962	Diesel and light diesel oil	215,240	0.55	392.2
Japan[d]				
1961	Diesel and light diesel oil	16,350[e]	0.26	62.0
1962	Diesel and light diesel oil	19,700[e]	0.23	87.0
Korea, Republic of				
1962	Diesel and light diesel oil (10,163 to 10,918 kcal/kg)	20,323	0.27	74.8
Laos				
1961	Diesel and light diesel oil (10,500 kcal/kg)	3,060	0.40	7.6
	Charcoal[f] (7,500 kcal/kg)	640	1.60	0.4
1962	Diesel and light diesel oil	3,560	0.40	9.0
	Charcoal[f]	627	1.56	0.4
Malaysia:				
Former Federation of Malaya				
1961	Diesel and light diesel oil	23,617	0.25	93.1[g]
1962[h]	Diesel and light diesel oil	5,517	0.28	19.7
North Borneo (Sabah)				
1961	Diesel and light diesel oil ((10,500 kcal/kg)	5,620[i]	0.30	18.7
1962	Diesel and light diesel oil	5,960[j]	0.26	22.9
Sarawak				
1961	Diesel and light diesel oil	6,190	0.27	23.0
1962	Diesel and light diesel oil	6,940	0.26	26.6
Singapore[k]				
1961	Diesel and light diesel oil (10,950 kcal/kg)	492		
	Furnace oil (10,290 kcal/kg)	2,608		
	Total diesel oil equivalent	2,943	0.31	9.8
1962	Diesel and light diesel oil (10,370 kcal/kg)	726		
	Furnace oil (10,310 kcal/kg)	542		
	Total diesel oil equivalent	1,271	0.32	3.92

Table 3

B. *Diesel power stations (Continued)*

Country and year (1)	Fuel consumption: Kind of fuel (2)	Total consumption (thousand kg) (3)	kg per kWh generated (4)	Generation (million kWh) (5)
Nepal				
1961	Diesel and light diesel oil . . . . (10,000 kcal/kg)	1,250	0.30	4.1
1962	Diesel and light diesel oil	1,800	0.32	5.6
Pakistan				
1961	Diesel and light diesel oil	56,800	0.26	220.3
1962	Diesel and light diesel oil	30,224	0.29	102.8
Philippines				
1961	Diesel and light diesel oil	59,500	0.43	137.1
1962	Diesel and light diesel oil	6,573	0.35	18.8
Thailand				
1961	Diesel and light diesel oil . . . . (10,920 kcal/kg)	61,301	0.30	205.2
1962	Diesel and light diesel oil	47,728	0.31	155.5
Viet-Nam, Republic of				
1961	Diesel oil equivalent . . . . (10,200 kcal/kg)	26,936	0.26	102.6
1962	Diesel oil (10,300 kcal/kg)	36,150	0.26	139.3
Western Samoa				
1962	Diesel and light diesel oil	175	0.23	0.76

[a] No data available for Afghanistan, Australia, Hong Kong, Iran and Mongolia.
No 1961 data available for Cambodia, Republic of Korea and Western Samoa.
No generation by diesel stations in New Zealand.

[b] Relating to fiscal year ended 30 September of the specified year.

[c] Relating only to Chunnakam Central Power Station.

[d] Relating to fiscal year ended 31 March of subsequent year.

[e] Equivalent to 18,600 and 22,376 kl respectively for the year 1961 and 1962 at 0.88 specific gravity.

[f] Used in gas engine generating plant.

[g] Including 1.1 million kWh generated by diesel house sets in steam power stations.

[h] Excluding Central Electricity Board, owing to non-availability of data.

[i] Equivalent to 1,404,000 imperial gallons at 0.88 specific gravity.

[j] Equivalent to 1,490,000 imperial gallons at 0.88 specific gravity.

[k] Relating to consumption of gas turbo-alternator set.

Table 4: OVER-ALL THERMAL EFFICIENCY OF PUBLIC UTILITY POWER STATIONS, 1961 AND 1962[a]

Country (1)	Name of station (2)	Installed capacity (MW) 1961 (3)	Installed capacity (MW) 1962 (4)	Thermal efficiency (percentage) 1961 (5)	Thermal efficiency (percentage) 1962 (6)
Burma	Ywama	20.0	20.0	13.49	14.45
	Ahlone	35.0	35.0	12.87	13.46
China (Taiwan)	Shenao	200.0	200.0	32.67	34.65
Hong Kong	Kowloon	182.5	302.5	26.63	27.39
	North Point, Hong Kong Island	182.5	182.5	22.64	22.92
India	Durgapur	165.0	165.0	29.10	30.50
	Bokaro	255.0	255.0	28.10	30.20
	Paras	30.0	30.0	...	25.90
	Korba	90.0	90.0	...	25.70
	Trombay	187.5	187.5	32.40	25.20
Iran[b]	Tarasht	50.0	50.0	23.00	23.50
Japan	Yokohama		525.0		37.13
	Shin Minato	156.0	156.0	36.59	36.69
	Amagasaki 3		312.0		36.41
	Yokosuka	265.0	530.0	35.68	36.16
	Mizushima	125.0	125.0	35.80	36.07
	Sendai	350.0	525.0	35.73	35.86
	Kawasaki	525.0	525.0	35.64	35.69
	Shin Nagoya	596.0	816.0	35.51	35.43
	Osaka	624.0	624.0	35.12	35.36
	Chiba	600.0	600.0	35.10	35.22
Korea, Republic of	Power barge		30.0		26.50
	Tanginri (No. 3)	25.0	25.0	25.30	24.30
	Masan	50.0	50.0	25.50	26.10
	Sanschok	25.0	25.0	25.80	25.30
Malaysia: Former Federation of Malaya	Connaught Bridge	80.0	80.0	25.74	25.75
	Penang	30.0	30.0	24.45	24.38
	Malacca	30.0	30.0	24.17	24.40
Singapore	Pasir Panjang	152.0	177.0	27.37	27.10
New Zealand	Meremere	180.0	180.0	...	34.30[b]
Philippines	Rockwell	245.0	245 {5×25, 2×60}	...	28.00 / 34.00
Thailand	North Bangkok	75.0	75.0	32.0	31.6
	Mae Moh	12.5	12.5	19.0[b]	19.0[b]
Viet-Nam, Republic of	Choquand	49.0	49.0	16.2	16.3

[a] No data available for Afghanistan, Australia, Cambodia, Indonesia, Mongolia and Pakistan.

No public utility steam power station in operation in Brunei, Laos, North Borneo (Sabah) and Sarawak of Malaysia, Nepal and Western Samoa.

In Ceylon, the two steam stations at Colombo were mantained only as standby and the new station at Grandpas was in operation only for one month in late 1962.

[b] Estimated.

Table 5: VOLTAGES AND FREQUENCIES IN USE IN PUBLIC SUPPLY SYSTEMS, 1962[a]

Country (1)	*Generation voltages (kV)* (2)	*Transmission (voltages) (kV)* (3)	*Sub-transmission and high-voltage primary distribution voltages (kV)* (4)	*Low voltage distribution; voltages and system of supply* (5)	*Frequency (cps)* (6)
Afghanistan	6.0, 3.0, 2.3 and 0.38	110 and 44	20 and 15	380/220V 3 ph 4 wire	50 and 60
Australia	11	330, 275, 220, 132, 110, 88, 66, 33 and 22	22, 12.7, 11 and 6.6	415-440/240-254 3 ph 4 wire 220-440 .DC 3 wire	40 and 50
Brunei	11 and 0.4	—	11 and 6.6	415/240V 3 ph 4 wire	50
Burma	11, 6.6 and 0.4	230, 132 and 33	33, 11 and 6.6	400/230V 3 ph 4 wire	50
Cambodia	6.6	—	15kV 3 ph 6.6kV 3 ph 4.4kV 2 ph 4 wire[b]	220V 2 ph 4 wire [b] 380/220V 3 ph 4 wire 220/127V 3 ph 4 wire 110V 1 ph. 2 wire	50
Ceylon	11 and 3.8	132 and 66	33, 11 and 3.3	400/230V 3 ph 4 wire	50
China (Taiwan)	16.0, 13.8, 11, 6.6 and 3.3	154 and 66	33, 11, 5.7 and 3.3	220V and 110V	60
Hong Kong	22.0, 11.8, 11.0 and 6.6	33	11 and 6.6	346/200V 3 ph 4 wire	50
India	33, 11, 6.6, 5.5, 3.3, 2.2 and 0.5 and 0.4	220, 132, 110, 66, 37.5 and 33	22, 15, 11, 6.6, 3.3 and 2.2	400/230V 3 ph 4 wire	50
Indonesia	6.6, 3.3, 0.44, 0.22 and 0.11	70, 30 and 25	25, 15, 12, 7, 6 and 3	220/127V 3 ph 4 wire 380/220V 3 ph 4 wire	50
Iran	13.8, 11, 6.6, 6, 3, 2, 1 and 0.4	220, 132, 66, 63 and 33	20, 11, 6.6, 6 and 3	400/230V 3 ph 4 wire 380/220V 3 ph 4 wire	50
Japan	18, 15.4, 15, 13.8, 13.2, 12.6, 12, 11, 6.6, 6, 3.45 and 3.3	275, 200, 187, 154, 110, 77, 66, 55, 44, 33, 22 and 11	10.4, 6, 5.2 and 3	440/254V 3 ph 4 wire 220V 3 ph 3 wire 100V 1 ph 2 wire	50 and 60
Korea, Republic of	13.8, 11, 3.45 and 3.3	154, 66 and 22	6.6, 5.7 and 3.3	200V, 3 ph 3 wire 100V, 1 ph 2 wire	60
Laos	6.6, 0.380 and 0.220	—	6.6, 0.380 and 0.220	380/220V, 3 ph 4 wire 200/127V, 3 ph 4 wire	50
Malaysia:					
Former Federation of Malaya	11, 6.6, 3.3, 2.2, 1.45 and 0.4	66, 33 and 22	33, 22, 11, 6.6, 5.5, 3.3 and 2.2	400/230V, 3 ph 4 wire	50
North Borneo (Sabah)	22, 6.6 and 0.4	—	22, 11 and 6.6	400/230V, 3 ph 4 wire	50
Sarawak	11, 6.6 and 0.42	11 and 6.6	11 and 6.6	420/240V, 3 ph 4 wire 400/230V, 3 ph 4 wire	50
Singapore	22 and 6.6	22	6.6	400/230V, 3 ph 4 wire	50
Nepal[c]	11, 3.3 and 0.4	11	2.3	400/230V, 3 ph 4 wire and 110V, 1 ph 2 wire	60 and 50
New Zealand	11.0, 6.6	220, 110, 66 and 50	33, 11 and 6.6	400/230V, 3 ph 4 wire	50
Pakistan	11, 6.6, 3.3 and 0.400	220, 132 and 66	33 and 11	400/230V, 3 ph 4 wire	50
Philippines	13.8 and 2.4	230, 115, 69 and 34.5	23, 13.8, 6.24, 4.8, 3.3 and 2.4	440V,220V and 110V, 3 ph 3 wire	60
Thailand					
Bangkok-Thonburi	13.8 11.0 3.5	— —	69 11 3.5	440/220V, 1 ph 3 wire 220V, 3 ph 3 wire 380/220V, 3 ph 4 wire 190/110V, 3 ph 4 wire	50
Rural area	11.5 11.0 0.230 0.400	—	33 12 1.1 10 3.5	190/110V, 3 ph 4 wire 220V, 1 ph 2 wire 400/230V, 3 ph 4 wire 416/240V, 3 ph 4 wire	50
Viet-Nam, Republic of	7, 6.6, 3.3, 3 and 0.22 220V and 110V D.C.	30 and 15 —	15, 7, 6.6 and 3 —	380/220V 3 ph 4 wire 220/127V 3 ph 4 wire 208/120V 3 ph 4 wire 220V and 110V D.C.	50
Western Samoa	2.2 and 0.4	—	6.6 and 2.2	400/230V 3 ph 4 wire 230V 1 ph 2 wire 230/115V 1 ph 3 wire	50

[a] No data available for Mongolia.
[b] For Phonom Penh only.
[c] The frequency will in the near future be unified at 50 cycles per second.

Table 6: Length and Voltage of Transmission and High Voltage Distribution Lines, 1961 and 1962

(All length in circuit kilometres)

Country and year (1)	2 to 11 kilovolts		13.2 to 15 kilovolts		22 kilovolts		33 to 44 kilovolts		66 to 75 kilovolts		100 to 110 kilovolts	132 to 154 kilovolts		220 kilovolts and over
	OH (2)	UG (3)	OH (4)	UG (5)	OH (6)	UG (7)	OH (8)	UG (9)	OH (10)	UG (11)	OH (12)	OH (13)	UG (14)	OH (15)
ECAFE region (22 countries)														
1961[a]	151,225.7	11,723.6	1,318.7	298.4	23,385.1	4,010.7	34,808.0	2,199.8	53,523.2	746.0	17,204.8	25,209.6	103.1	9,331.1
1962[b]	161,877.3	12,788.6	1,752.3	344.6	25,856.6	4,293.6	35,921.9	2,069.9	56,785.9	887.0	18,637.2	26,606.5	137.1	10,769.9
Afghanistan[c]														
1961	...	...	...	35.0	—	—	170.0	—	—	—	160.0	—	—	—
1962	...	...	...	35.0	—	—	170.0	—	—	—	160.0	—	—	—
Brunei														
1961	12.9	25.8	—	—	—	—	—	—	—	—	—	—	—	—
1962	12.9	35.1	—	—	—	—	—	—	—	—	—	—	—	—
Burma[d]														
1961	2,597.6	—	—	—	—	—	774.1	49.8	—	—	—	362.0	—	404.0
1962	2,655.0	282.0	—	—	—	—	776.5	49.8	—	—	—	362.0	—	404.0
Cambodia														
1961	35.0	—	—	—	—	—	—	—	—	—	—	—	—	—
1962	100.0	—	—	20.0	—	—	—	—	—	—	—	—	—	—
Ceylon														
1961	400.0	228.0	—	—	—	—	1,473.0	38.0	283.0	—	—	85.0	—	—
1962	441.5	240.0	—	—	—	—	1,555.0	38.0	283.1	—	—	85.0	—	—
China (Taiwan)														
1961	13,064.0	56.0	—	—	—	—	1,523.0	22.0	933.0	—	—	1,079.0	—	—
1962	14,139.0	56.0	—	—	—	—	1,062.0	25.0	1,182.0	—	—	1,162.0	—	—
Hong Kong														
1961	184.6	641.6	—	—	—	84.1	188.9	131.5	15.1	—	—	—	—	—
1962	204.5	755.3	—	—	—	73.8	196.9	160.7	44.8	—	—	—	—	—
India[e]														
1961	100,609.0	5,104.0	—	—	9,599.0	395.0	18,818.0	445.0	12,238.0	—	6,185.0	7,049.0	—	1,102.0
1962	110,742.0	5,982.0	52.0	—	12,016.0	504.0	19,851.0	445.0	12,795.0	—	7,518.0	7,021.0	—	1,164.0
Indonesia														
1961	1,350.0	1,712.2	355.7	166.3	2,241.5	—	—	6.4	1,056.0	—	—	—	—	—
1962	1,350.0	1,712.2	355.7	166.3	2,241.5	—	—	6.4	1,056.0	—	—	—	—	—
Iran[f]														
1961	...	...	—	—	10.0	250.0	15.0	—	41.0	—	—	166.0	—	—
1962	...	...	—	—	16.0	250.0	15.0	—	41.0	—	—	166.0	—	160.0
Japan[g]														
1961	1,292.1	313.3	—	—	7,703.3	2,826.8	9,650.0	283.3	31,246.7	738.4	4,780.3[h]	12,648.6	103.1	5,311.2
1962	1,238.2	267.8	—	—	7,621.7	2,898.1	9,593.5	315.0	32,014.0	869.3	4,808.7[h]	13,089.0	137.1	6,028.0
Korea, Republic of														
1961	14,362.0	4.0	—	—	2,887.0	14.0	—	—	2,240.0	—	—	1,140.0	—	—
1962	12,235.0	—	—	—	2,939.5	97.0	—	—	2,607.1	—	—	1,061.5	—	—
Laos														
1961	16.0	2.6	—	—	—	—	—	—	—	—	—	—	—	—
1962	23.0	2.6	—	—	—	—	—	—	—	—	—	—	—	—

Table 6 (Cont'd)

Country and year (1)	2 to 11 kilovolts OH (2)	2 to 11 kilovolts UG (3)	13.2 to 15 kilovolts OH (4)	13.2 to 15 kilovolts UG (5)	22 kilovolts OH (6)	22 kilovolts UG (7)	33 to 44 kilovolts OH (8)	33 to 44 kilovolts UG (9)	66 to 75 kilovolts OH (10)	66 to 75 kilovolts UG (11)	100 to 110 kilovolts OH (12)	132 to 154 kilovolts OH (13)	132 to 154 kilovolts UG (14)	220 kilovolts and over OH (15)
Malaysia:														
Former Federation of Malaya														
1961	744.2	1,223.1	—	—	530.0	20.0	485.0	8.8	515.0	—	—	—	—	—
1962	754.9	1,431.6	—	—	547.6	20.0	516.0	—	515.0	—	—	—	—	—
North Borneo (Sabah)														
1961	113.0	—	—	—	—	—	—	—	—	—	—	—	—	—
1962	113.0	—	—	—	32.0	—	—	—	—	—	—	—	—	—
Sarawak														
1961	43.5	49.1	—	—	—	—	—	—	—	—	—	—	—	—
1962	53.8	66.1	—	—	—	—	—	—	—	—	—	—	—	—
Singapore														
1961	—	633.9	—	—	9.3	420.8	—	—	—	—	—	—	—	—
1962	—	680.3	—	—	9.3	450.7	—	—	18.1	—	—	—	—	—
Nepal[i]														
1961	75.0	0.1	—	—	—	—	—	—	—	—	—	—	—	—
1962	75.0	0.1	—	—	—	—	—	—	—	—	—	—	—	—
New Zealand[j]														
1961	6,319.0	—	—	—	—	—	156.0	1,215.0	1,382.0	—	5,850.0	—	—	1,835.0
1962	6,448.0	—	—	—	—	—	261.0	1,030.0	1,383.0	—	5,921.0	—	—	2,479.0
Pakistan														
1961	9,250.0	402.0	—	—	—	—	1,345.0	—	2,570.0	7.6	—	2,680.0	—	249.0
1962	10,650.0	920.0	—	—	—	—	1,715.0	—	3,970.0	17.7	—	3,660.0	—	249.0
Philippines														
1961	135.0	—	537.0	—	405.0	—	115.0	—	462.4	—	229.5	—	—	429.9
1962	135.0	—	592.0	—	433.0	—	115.0	—	557.4	—	229.5	—	—	429.9
Thailand[k]														
1961	499.0	95.0	283.9[l]	7.9[l]	—	—	55.0	—	293.0	—	—	—	—	—
1962	313.9	70.9	594.6[l]	36.3[l]	—	—	55.0	—	319.4	—	—	—	—	—
Viet-Nam, Republic of														
1961	123.8	232.9	142.1	89.2	—	—	40.0	—	—	—	—	—	—	—
1962	158.0	266.0	158.0	87.0	—	—	40.0	—	—	—	—	—	—	—
Western Samoa														
1962	34.6	20.6	—	—	—	—	—	—	—	—	—	—	—	—

[a] Excluding Australia, Mongolia and Western Samoa owing to non-availability of data.
[b] Excluding Australia and Mongolia owing to non-availability of data.
[c] Relating to fiscal year ended 20 March of subsequent year and including lines of self supply industry plants.
[d] Relating to fiscal year ended 30 September of the specified year.
[e] Relating to fiscal year ended 31 March of subsequent year.
[f] Relating to fiscal year ended 20 March of subsequent year.
[g] Relating to fiscal year ended 31 March of subsequent year and including only Nine Power Companies and Electric Power Development Company.
[h] Including 1.1 km and 9.7 km underground line respectively for the year 1961 and 1962.
[i] Relating only to Government Electricity Department, Kathmandu.
[j] Relating to fiscal year ended 31 March of subsequent year and only to New Zealand Electricity Department lines.
[k] Excluding distribution lines under the control of Provincial Electricity Authority.
[l] Relating to 12 kV lines.

Table 7: NUMBER OF TOWNS AND VILLAGES SUPPLIED WITH ELECTRICITY, 1961 AND 1962[a]

Year and item (1)		Population: Over 100,000 (2)	50,001 to 100,000 (3)	20,001 to 50,000 (4)	10,001 to 20,000 (5)	5,000 to 10,000 (6)	Below 5,000 (7)	Total (8)
				Afghanistan[b]				
1961	Total	2	2	7	...	...	...	...
	Electrified	2	2	6	...	...	...	...
	Percentage	100	100	85.6	...	...	...	...
1962	Total	2	2	7	...	...	...	...
	Electrified	2	2	7	...	...	...	...
	Percentage	100	100	100	...	...	...	...
				Brunei				
1961	Total	—	—	—	1	2	3	6
	Electrified	—	—	—	1	2	3	6
	Percentage	—	—	—	100	100	100	100
1962	Total	—	—	—	1	2	3	6
	Electrified	—	—	—	1	2	3	6
	Percentage	—	—	—	100	100	100	100
				Burma[c]				
1962	Total	2	2	20	25	51	878	978
	Electrified	2	2	20	25	51	584	684
	Percentage	100	100	100	100	100	66.5	70
				Cambodia				
1961	Electrified	1	1	3	5	10	32	52
1962	Electrified	1	2	5	5	2	50	65
				China (Taiwan)				
1961	Total	10	26	171	74	25	—	306
	Electrified	10	26	171	72	22	—	301
	Percentage	100	100	100	97.3	88	—	98.4
1962	Total	10	27	171	75	21	20	324
	Electrified	10	27	171	74	19	9	310
	Percentage	100	100	100	98.7	90.5	45.0	95.7
				India[d]				
1961	Total	73	111	401	856	3,101	556,564	561,106
	Electrified	73	111	380	727	1,723	23,811	26,825
	Percentage	100	100	94.8	84.9	55.6	4.3	4.8
				Iran[b]				
1961	Total	9	10	34	36	76	...	...
	Electrified	9	10	34	31	50	...	...
	Percentage	100	100	100	86	66	...	...
1962	Total	9	10	34	36	76	...	...
	Electrified	9	10	34	31	50	...	...
	Percentage	100	100	100	86	66	...	...
				Japan[e]				
1961	Total	113	200	596	1,194	1,119	328	3,550
	Electrified	113	200	596	1,194	1,119	328	3,550
	Percentage	100	100	100	100	100	100	100
				Korea, Republic of				
1961	Total	9	19	121	735	595	26	1,505
	Electrified	9	19	102	311	112	3	556
	Percentage	100	100	84.5	42.3	18.8	11.5	36.9
1962	Total	9	19	121	735	595	26	1,050
	Electrified	9	19	103	310	115	2	508
	Percentage	100	100	85.1	42.2	19.3	7.7	37.1
				Laos				
1962	Electrified	—	—	—	1	3	1	6
				Malaysia Former Federation of Malaya[f]				
1961	Total	2	—	3	6	13	93	117
	Electrified	2	—	2	6	11	53	74
	Percentage	100	—	66.7	100	84.6	57.0	63.3
1962	Total	2	—	3	6	13	98	122
	Electrified	2	—	2	6	11	61	82
	Percentage	100	—	66.7	100	84.6	62.2	67.2

Table 7 *(Cont'd)*

Year and item (1)		Population: Over 100,000 (2)	50,001 to 100,000 (3)	20,001 to 50,000 (4)	10,001 to 20,000 (5)	5,000 to 10,000 (6)	Below 5,000 (7)	Total (8)
				North Borneo (Sabah)				
1961	Total	—	—	2	2	...	...	...
	Electrified	—	—	2	2	...	...	...
	Percentage	—	—	100	100	...	...	...
1962	Total	—	—	2	2	...	...	...
	Electrified	—	—	2	2	...	...	...
	Percentage	—	—	100	100	...	...	...
				Sarawak				
1961	Total	—	1	1	1	4	...	...
	Electrified	—	1	1	1	4	9	16
	Percentage	—	100	100	100	100	...	...
1962	Total	—	1	1	1	4	...	...
	Electrified	—	1	1	1	4	8	15
	Percentage	—	100	100	100	100	...	...
				Singapore				
1961	Total	1	1	—	—	—	87	89
	Electrified	1	1	—	—	—	59	61
	Percentage	100	100	—	—	—	67.9	68.5
1962	Total	1	1	—	—	—	87	89
	Electrified	1	1	—	—	—	64	66
	Percentage	100	100	—	—	—	73.6	74.2
				Nepal[g]				
1961	Electrified	1	1	2	—	10	13	27
1962	Electrified	1	1	2	—	10	13	27
				Philippines				
1961	Total	12	52	383	510	290	119	1,366
	Electrified	12	46	237	154	61	6	516
	Percentage	100	88.6	61.6	30.2	21	5	37.7
1962	Total	13	56	400	513	278	106	1,366
	Electrified	13	50	256	190	59	4	572
	Percentage	100	89.3	64	37	21.2	3.8	41.9
				Thailand[h]				
1961	Total	49	155	229	52	16	7	508
	Electrified	48	126	145	13	—	1	333
	Percentage	98.0	81.3	63.3	25.0	—	14.3	65.5
1962	Total	49	172	225	60	12	8	526
	Electrified	49	154	161	23	2	1	390
	Percentage	100	89.5	71.6	38.3	16.7	12.5	74.1
				Western Samoa				
1962	Total	—	—	1	—	—	220	221
	Electrified	—	—	1	—	—	13	14
	Percentage	—	—	100	—	—	5.9	6.3

[a] Definitions of towns and villages adopted by countries are not uniform and therefore figures are not readily comparable. In some cases, the total number of villages under column 8 does not include all the population of the country.
No data available for Australia, Ceylon, Indonesia, Mongolia, New Zealand, Pakistan and the Republic of Viet-Nam.
No 1961 data available for Burma, Laos and Western Samoa.
No 1962 data available for India and Japan.
Electricity supply is available to all inhabited parts of Hong Kong.

[b] Relating to fiscal year ended 20 March of subsequent year.

[c] Relating to fiscal year ended 30 September 1962.

[d] Relating to fiscal year ended 31 March of subsequent year.

[e] 99.6% of all the houses in Japan were supplied with electricity.

[f] Relating only to towns electrified by Penang Electricity Supply Department and Perak River Hydro-Electric Power Co. Ltd.

[g] Relating to towns and villages of Kathmandu valley only.

[h] Town in this respect is classified as "Amphur" and "King Amphur" which corresponds to a district.

Table 8: Classification of Public Utility Power Stations according to Installed Capacity, 1961 and 1962

A. Steam stations[a]

Country, year and item (1)	Installed capacity (kW) Up to 500 (2)	501 to 1,000 (3)	1,001 to 5,000 (4)	5,001 to 10,000 (5)	10,001 to 50,000 (6)	Over 50,000 (7)	Total (8)
Afghanistan[b]							
1961 Number of stations	4	—	2	—	—	—	6
Aggregate installed capacity[c]	1.0	—	4.0	—	—	—	5.0
Aggregate generation[d]	...	—	2.0	—	—	—	2.0
Average plant factor[e]	...	—	5.7	—	—	—	4.6
1962 Number of stations	3	—	2	—	—	—	5
Aggregate installed capacity[c]	0.7	—	4.0	—	—	—	4.7
Aggregate generation[d]	0.1	—	8.1	—	—	—	8.2
Average plant factor[e]	1.6	—	23.1	—	—	—	19.9
Burma[f]							
1961 Number of stations	—	—	1	—	2	—	3
Aggregate installed capacity[c]	—	—	2.7	—	55.0	—	57.7
Aggregate generation[d]	—	—	2.6	—	41.1	—	43.7
Average plant factor[e]	—	—	11.0	—	8.6	—	8.7
1962 Number of stations	—	—	1	—	2	—	3
Aggregate installed capacity[c]	—	—	2.7	—	55.0	—	57.7
Aggregate generation[d]	—	—	3.0	—	44.0	—	47.0
Average plant factor[e]	—	—	12.7	—	9.1	—	9.3
Cambodia							
1961 Number of stations	—	—	1	—	—	—	1
Aggregate installed capacity[c]	—	—	3.0	—	—	—	3.0
Aggregate generation[d]	—	—	7.9	—	—	—	7.9
Average plant factor[e]	—	—	30.0	—	—	—	30.0
1962 Number of stations	—	—	1	—	—	—	1
Aggregate installed capacity[c]	—	—	3.0	—	—	—	3.0
Aggregate generation[d]	—	—	8.2	—	—	—	8.2
Average plant factor[e]	—	—	31.2	—	—	—	31.2
Ceylon							
1961 Number of stations	—	—	2	—	—	—	2
Aggregate installed capacity[c]	—	—	12.0	—	—	—	12.0
Aggregate generation[d]	—	—	1.5	—	—	—	1.5
Average plant factor[e]	—	—	1.4	—	—	—	1.4
1962 Number of stations	—	—	2	—	1	—	3
Aggregate installed capacity[c]	—	—	12.0	—	25.0	—	37.0
Aggregate generation[d]	—	—	17.2	—	7.8	—	25.0
Average plant factor[e]	—	—	16.4	—	3.6	—	7.7
China (Taiwan)							
1961 Number of stations	—	—	1	—	2	3	6
Aggregate installed capacity[c]	—	—	2.0	—	23.5	355.0	380.5
Aggregate generation[d]	—	—	7.5	—	77.3	1,645.4	1,730.2
Average plant factor[e]	—	—	42.9	—	37.6	52.9	52.0
1962 Number of stations	—	—	1	—	2	3	6
Aggregate installed capacity[c]	—	—	2.0	—	23.5	355.0	380.5
Aggregate generation[d]	—	—	8.8	—	42.0	2,473.4	2,524.2
Average plant factor[e]	—	—	50.2	—	20.4	79.5	75.7
Hong Kong							
1961 Number of stations	—	—	—	—	—	2	2
Aggregate installed capacity[c]	—	—	—	—	—	365.0	365.0
Aggregate generation[d]	—	—	—	—	—	1,542.1	1,542.1
Average plant factor[e]	—	—	—	—	—	48.2	48.2
1962 Number of stations	—	—	—	—	—	2	2
Aggregate installed capacity[c]	—	—	—	—	—	485.0	365.0
Aggregate generation[d]	—	—	—	—	—	1,786.6	1,786.6
Average plant factor[e]	—	—	—	—	—	42.1	42.1

Table 8 A *(Cont'd)*

Country, year and item (1)	Installed capacity (kW) Up to 500 (2)	501 to 1,000 (3)	1,001 to 5,000 (4)	5,001 to 10,000 (5)	10,001 to 50,000 (6)	Over 50,000 (7)	Total (8)
India[g]							
1961 Number of stations	8	4	22	12	31	15	92
Aggregate installed capacity[c]	1.8	3.3	63.7	89.8	620.7	1,686.7	2,466.0
Aggregate generation[d]	2.8	3.9	98.2	176.5	2,256.6	6,937.8	9,475.8
Average plant factor[e]	17.7	13.5	17.6	22.4	41.3	47.0	43.7
1962 Number of stations	3	3	19	12	30	16	83
Aggregate installed capacity[c]	0.9	2.1	63.7	88.8	589.0	1,791.8	2,536.3
Aggregate generation[d]	0.5	4.0	101.2	151.1	1,837.2	8,082.9	10,176.9
Average plant factor[e]	6.3	21.7	18.1	19.4	35.6	51.5	45.8
Indonesia							
1961 Number of stations	...	...	...	...	...	...	...
Aggregate installed capacity[c]	...	...	...	...	...	...	24.6
Aggregate generation[d]	...	...	...	...	...	...	57.0
Average plant factor[e]	...	...	...	...	...	...	26.4
1962 Number of stations	—	—	1	1	2	—	4
Aggregate installed capacity[c]	—	—	1.9	8.0	35.9	—	45.8
Aggregate generation[d]	—	—	3.6	15.4	53.6	—	72.6
Average plant factor[e]	—	—	21.6	22.0	17.1	—	18.1
Iran[h]							
1961 Number of stations	...	...	...	1	2	—	...
Aggregate installed capacity[c]	...	...	...	10.0	74.0	—	...
Aggregate generation[d]	...	...	...	55.0	243.0	—	...
Average plant factor[e]	...	...	...	62.8	37.5	—	...
1962 Number of stations	...	...	...	1	2	—	...
Aggregate installed capacity[c]	...	...	...	10.0	74.0	—	...
Aggregate generation[d]	...	...	...	53.0	200.0	—	...
Average plant factor[e]	...	...	...	60.5	30.8	—	...
Japan[g]							
1961 Number of stations	—	—	—	—	9	46	55
Aggregate installed capacity[c]	—	—	—	—	155.0	9,991.0	10,146.0
Aggregate generation[d]	—	—	—	—	...	...	54,313.0
Average plant factor[e]	—	—	—	—	...	...	61.0
1962 Number of stations	—	—	—	—	9	46	59
Aggregate installed capacity[c]	—	—	—	—	155.0	12,125.0	12,280.0
Aggregate generation[d]	—	—	—	—	...	...	66,808.0
Average plant factor[e]	—	—	—	—	...	...	62.1
Korea, Republic of							
1961 Number of stations	—	—	—	—	4	1	5
Aggregate installed capacity[c]	—	—	—	—	122.5	100.0	222.5
Aggregate generation[d]	—	—	—	—	739.6	378.7	1,118.3
Average plant factor[e]	—	—	—	—	68.9	43.2	57.4
1962 Number of stations	—	—	—	—	5	1	6
Aggregate installed capacity[c]	—	—	—	—	152.5	100.0	252.5
Aggregate generation[d]	—	—	—	—	930.8	267.8	1,198.6
Average plant factor[e]	—	—	—	—	69.7	30.6	54.2
Malaysia:							
Former Federation of Malaya							
1961 Number of stations	—	—	1	—	4	2	7
Aggregate installed capacity[c]	—	—	5.0	—	107.0	134.0	246.0
Aggregate generation[d]	—	—	...	—	265.5	696.3	961.8
Average plant factor[e]	—	—	...	—	28.3	59.4	44.6
1962 Number of stations	—	—	—	1	3	2	6
Aggregate installed capacity[c]	—	—	—	10	84.4	134.0	228.4
Aggregate generation[d]	—	—	—	15.7	293.4	738.0	1,048.1
Average plant factor[e]	—	—	—	18.0	39.7	62.9	52.3
Singapore[i]							
1961 Number of stations	—	—	—	—	—	1	1
Aggregate installed capacity[c]	—	—	—	—	—	152.0	152.0
Aggregate generation[d]	—	—	—	—	—	709.8	709.8
Average plant factor[e]	—	—	—	—	—	53.3	53.3

Table 8 A *(Cont'd)*

Country, year and item (1)		Installed capacity (kW): Up to 500 (2)	501 to 1,000 (3)	1,001 to 5,000 (4)	5,001 to 10,000 (5)	10,001 to 50,000 (6)	Over 50,000 (7)	Total (8)
1962	Number of stations	—	—	—	—	—	1	1
	Aggregate installed capacity[c]	—	—	—	—	—	177.0	177.0
	Aggregate generation[d]	—	—	—	—	—	771.8	771.8
	Average plant factor[e]	—	—	—	—	—	49.8	49.8
New Zealand[g]								
1961	Number of stations	—	—	—	—	2	2	4
	Aggregate installed capacity[c]	—	—	—	—	49.0	271.0	320.0
	Aggregate generation[d]	—	—	—	—	—	1,453.0	1,453.0
	Average plant factor[e]	—	—	—	—	—	61.1	52.0
1962	Number of stations	—	—	—	—	2	2	4
	Aggregate installed capacity[c]	—	—	—	—	49.0	342.0	391.0
	Aggregate generation[d]	—	—	—	—	—	1,172.0	1,172.0
	Average plant factor[e]	—	—	—	—	—	39.2	34.3
Pakistan								
1961	Number of stations	2	—	1	5	5	2	15
	Aggregate installed capacity[c]	0.6	—	5.0	35.9	98.8	199.7	340.0
	Aggregate generation[d]	1.1	—	13.1	77.7	181.7	524.2	797.8
	Average plant factor[e]	29.0	—	29.9	24.7	21.0	30.0	26.8
1962	Number of stations	2	—	—	6	5	2	15
	Aggregate installed capacity[c]	0.6	—	—	43.4	98.8	265.7	408.5
	Aggregate generation[d]	0.2	—	—	98.3	159.2	679.6	937.3
	Average plant factor[e]	3.8	—	—	24.8	18.4	29.2	26.2
Philippines								
1961	Number of stations	—	—	—	1	1	1	3
	Aggregate installed capacity[c]	—	—	—	8.6	34.5	245.0	288.1
	Aggregate generation[d]	—	—	—	34.8	12.6	1,184.8	1,232.2
	Average plant factor[e]	—	—	—	46.2	4.2	55.2	48.8
1962	Number of stations	—	—	—	1	1	1	3
	Aggregate installed capacity[c]	—	—	—	8.6	34.5	245.0	288.1
	Aggregate generation[d]	—	—	—	43.2	[j]	1,564.1	1,607.3
	Average plant factor[e]	—	—	—	57.4	...	...	63.7
Thailand								
1961	Number of stations	—	—	—	—	3	1	4
	Aggregate installed capacity[c]	—	—	—	—	60.0	75.0	135.0
	Aggregate generation[d]	—	—	—	—	136.6	260.0	396.6
	Average plant factor[e]	—	—	—	—	26.0	39.6	33.5
1962	Number of stations	—	—	—	—	3	1	4
	Aggregate installed capacity[c]	—	—	—	—	62.6	75.0	137.6
	Aggregate generation[d]	—	—	—	—	82.9	461.9	544.8
	Average plant factor[e]	—	—	—	—	15.1	70.1	45.1
Viet-Nam, Republic of								
1961	Number of stations	—	—	—	—	1	—	1
	Aggregate installed capacity[c]	—	—	—	—	49.0	—	49.0
	Aggregate generation[d]	—	—	—	—	216.7	—	216.7
	Average plant factor[e]	—	—	—	—	50.4	—	50.4
1962	Number of stations	—	—	—	—	1	—	1
	Aggregate installed capacity[c]	—	—	—	—	49.0	—	49.0
	Aggregate generation[d]	—	—	—	—	218.1	—	218.1
	Average plant factor[e]	—	—	—	—	50.7	—	50.7

[a] No public supply steam stations in Brunei, Laos, North Borneo (Sabah) and Sarawak, Nepal and Western Samoa.

[b] Relating to fiscal year ended 20 March of subsequent year and to power plants of installed capacity 100 kW and over, including self-supplying industrial plants.

[c] In thousand kW.

[d] In million kWh.

[e] Expressed by means of the following ratio in percentage:

$$\frac{\text{Aggregate kWh}}{\text{Aggregate kW} \times 8{,}760}$$

[f] Relating to fiscal year ended 30 September of the specified year.

[g] Relating to fiscal year ended 31 March of subsequent year.

[h] Relating to fiscal year ended 20 March of subsequent year, data being incomplet.

[i] Pasir Panjang station consisting of steam turbo-alternator main units, each of 25 MW and a 2 MW standby open cycle gas turbine alternator house set.

[j] Included in column (7).

Table 8 *(Cont'd)*

B. Hydro-electric stations[a]

Country, year and item (1)	Installed capacity (kW) Up to 500 (2)	501 to 1,000 (3)	1,001 to 5,000 (4)	5,001 to 10,000 (5)	10,001 to 50,000 (6)	Over 50,000 (7)	Total (8)
Afghanistan[b]							
1961 Number of stations	2	1	5	1	1	—	10
Aggregate installed capacity[c]	0.4	0.7	15.4	9.5	22.0	—	48.0
Aggregate generation[d]	...	...	28.0	...	88.0	—	116.0
Average plant factor[e]	...	...	20.7	...	45.7	—	27.6
1962 Number of stations	4	1	5	1	1	—	2
Aggregate installed capacity[c]	0.8	0.7	15.4	9.0	22.0	—	47.9
Aggregate generation[d]	0.3	1.9	32.0	4.4	110.2	—	148.8
Average plant factor[e]	4.3	31.0	23.7	5.6	57.0	—	35.5
Burma[f]							
1961 Number of stations	1	—	—	—	—	1	2
Aggregate installed capacity[c]	0.5	—	—	—	—	84.0	84.5
Aggregate generation[d]	2.3	—	—	—	—	180.0	182.3
Average plant factor[e]	52.5	—	—	—	—	24.5	24.7
1962 Number of stations	1	—	—	—	—	1	1
Aggregate installed capacity[c]	0.5	—	—	—	—	84.0	84.5
Aggregate generation[d]	1.9	—	—	—	—	205.6	207.5
Average plant factor[e]	43.3	—	—	—	—	27.9	28.0
Ceylon							
1961 Number of stations	—	—	—	1	1	—	2
Aggregate installed capacity[c]	—	—	—	5.5	50.0	—	55.5
Aggregate generation[d]	—	—	—	9.2	268.0	—	277.2
Average plant factor[e]	—	—	—	19.1	61.2	—	57.0
1962 Number of stations	—	—	—	1	1	—	2
Aggregate installed capacity[c]	—	—	—	5.5	50.0	—	55.5
Aggregate generation[d]	—	—	—	9.5	283.6	—	293.1
Average plant factor[e]	—	—	—	19.7	65.0	—	60.3
China (Taiwan)							
1961 Number of stations	1	3	7	2	8	8	29
Aggregate installed capacity[c]	0.2	2.7	17.2	15.6	232.8	269.5	538.0
Aggregate generation[d]	0.8	17.2	115.7	85.7	1,140.6	975.3	2,335.3
Average plant factor[e]	45.7	46.0	77.0	62.7	55.9	41.3	49.5
1962 Number of stations	1	3	7	2	8	3	24
Aggregate installed capacity[c]	0.2	2.7	17.2	15.6	232.8	269.5	538.0
Aggregate generation[d]	0.5	14.8	112.6	84.8	1,056.6	888.2	2,157.5
Average plant factor[e]	28.5	62.6	74.7	62.1	51.8	37.6	45.8
India[g]							
1961 Number of stations	11	1	16	4	19	14	65
Aggregate installed capacity[c]	1.1	0.6	39.3	23.4	577.0	1,592.7	2,234.1
Aggregate generation[d]	1.1	3.0	163.8	42.3	2,738.3	6,865.9	9,814.4
Average plant factor[e]	11.4	57.0	47.6	20.7	54.2	49.2	50.1
1962 Number of stations	10	1	16	2	22	16	67
Aggregate installed capacity[c]	1.1	0.6	37.6	14.4	655.1	2,207.7	2,916.5
Aggregate generation[d]	1.1	3.8	153.6	38.8	3,599.8	8,007.4	11,804.5
Average plant factor[e]	11.4	72.3	46.6	30.7	62.6	41.5	46.2
Indonesia							
1961 Number of stations	...	...	...	...	...	...	...
Aggregate installed capacity[c]	...	...	...	...	...	...	168.2
Aggregate generation[d]	...	...	...	...	...	...	774.5
Average plant factor[e]	...	...	...	...	...	...	52.6
1962 Number of stations	4	2	9	1	9	—	25
Aggregate installed capacity[c]	0.6	1.4	24.3	7.0	137.6	—	170.9
Aggregate generation[d]	...	...	...	...	...	—	777.3
Average plant factor[e]	...	...	...	...	...	—	52.0

Table 8 B *(Cont'd)*

Country, year and item (1)	Up to 500 (2)	501 to 1,000 (3)	1,001 to 5,000 (4)	5,001 to 10,000 (5)	10,001 to 50,000 (6)	Over 50,000 (7)	Total (8)
	Installed capacity (kW)						
Iran[h]							
1961 Number of stations	—	—	1	—	—	1	2
Aggregate installed capacity[c]	—	—	2.0	—	—	75.0	77.0
Aggregate production[d]	—	—	5.0	—	—	3.0	8.0
Average plant factor[e]	—	—	28.6	—	—	0.5	1.2
1962 Number of stations	...	...	1	...	...	2	...
Aggregate installed capacity[c]	...	...	2.0	...	...	205.0	...
Aggregate production[d]	...	...	5.0	...	...	88.0[i]	...
Average plant factor[e]	...	...	28.6	...	...	4.9	...
Japan[g]							
1961 Number of stations	—	425	450	187	270	48	1,380
Aggregate installed capacity[c]	—	167.0	1,034.0	1,250.0	5,654.0	4,470.0	12,575.0
Aggregate production[d]	—	...	...	...	...	...	62,426.0
Average plant factor[e]	—	...	...	...	...	...	56.6
1962 Number of stations	—	415	446	196	285	50	1,392
Aggregate installed capacity[c]	—	165.0	1,014.0	1,315.0	5,896.0	4,794.0	13,184.0
Aggregate production[d]	—	...	...	...	...	...	57,119.0
Average plant factor[e]	—	...	...	...	...	...	49.5
Korea, Republic of							
1961 Number of stations	1	—	3	—	2	1	7
Aggregate installed capacity[c]	0.2	—	8.3	—	54.0	81.0	143.5
Aggregate production[d]	0.4	—	46.3	—	266.3	339.5	652.5
Average plant factor[e]	22.8	—	63.7	—	56.6	47.9	51.9
1962 Number of stations	1	—	3	—	2	1	6
Aggregate installed capacity[c]	0.2	—	8.3	—	54.0	81.0	143.5
Aggregate production[d]	0.4	—	35.5	—	275.9	390.5	702.3
Average plant factor[e]	22.8	—	48.9	—	58.3	55.0	55.9
Malaysia:							
Former Federation of Malaya							
1961 Number of stations	—	1	1	—	1	—	3
Aggregate installed capacity[c]	—	0.9	2.3	—	27.0	—	30.2
Aggregate generation[d]	—	2.5	11.5	—	170.7	—	184.7
Average plant factor[e]	—	31.7	57.1	—	72.3	—	70.0
1962 Number of stations	—	1	1	—	1	—	3
Aggregate installed capacity[c]	—	0.9	2.3	—	27.0	—	30.2
Aggregate generation[d]	—	2.9	11.4	—	186.6	—	200.9
Average plant factor[e]	—	36.8	56.6	—	78.8	—	76.0
Nepal							
1961 Number of stations	1	—	2	—	—	—	3
Aggregate installed capacity[c]	0.5	—	2.9	—	—	—	3.4
Aggregate generation[d]	1.0	—	5.8	—	—	—	6.8
Average plant factor[e]	22.8	—	22.8	—	—	—	22.8
1962 Number of stations	1	—	2	—	—	—	3
Aggregate installed capacity[c]	0.5	—	2.9	—	—	—	3.4
Aggregate generation[d]	[j]	—	7.0	—	—	—	7.0
Average plant factor[e]	...	—	...	—	—	—	23.5
New Zealand[g]							
1961 Number of stations	11	4	7	2	6	12	42
Aggregate installed capacity[c]	3.0	3.0	19.0	12.0	181.0	1,263.0	1,481.0
Aggregate generation[d]	13.0	18.0	102.0	73.0	666.0	5,074.0	5,946.0
Average plant factor[e]	49.5	68.5	61.3	69.4	42.0	45.9	45.8
1962 Number of stations	11	4	7	3	6	12	43
Aggregate installed capacity[c]	3.0	3.0	19.0	18.0	181.0	1,324.0	1,548.0
Aggregate generation[d]	14.0	20.0	116.0	101.0	630.0	5,898.0	6,779.0
Average plant factor[e]	53.3	76.1	69.7	64.1	39.7	50.9	50.0

Table 8 B *(Cont'd)*

Country, year and item (1)	Installed capacity (kW) Up to 500 (2)	501 to 1,000 (3)	1,001 to 5,000 (4)	5,001 to 10,000 (5)	10,001 to 50,000 (6)	Over 50,000 (7)	Total (8)
Pakistan							
1961 Number of stations	—	—	2	—	5	1	8
Aggregate installed capacity[c]	—	—	5.1	—	88.3	160.0	253.4
Aggregate production[d]	—	—	20.4	—	345.2	435.2	800.8
Average plant factor[e]	—	—	45.7	—	44.6	31.1	36.4
1962 Number of stations	—	—	2	—	5	2	9
Aggregate installed capacity[c]	—	—	5.1	—	88.3	240.0	333.4
Aggregate production[d]	—	—	24.1	—	440.5	802.8	1,267.4
Average plant factor[e]	—	—	53.9	—	57.0	38.2	43.4
Philippines							
1961 Number of stations	17	2	3	—	3	2	27
Aggregate installed capacity[c]	5.9	1.4	5.0	—	103.0	175.0	290.3
Aggregate production[d]	35.1	6.4	27.6	—	382.0	735.7	1,186.8
Average plant factor[e]	67.8	52.0	63.0	—	42.3	48.0	46.7
1962 Number of stations	17	3	3	—	3	2	28
Aggregate installed capacity[c]	5.9	2.2	5.0	—	103.0	175.0	291.1
Aggregate production[d]	31.7	6.6	31.8	—	445.7	730.7	1,246.5
Average plant factor[e]	61.7	34.2	72.6	—	49.4	47.7	48.9
Viet-Nam, Republic of							
1961 Number of stations	3	—	1	—	—	—	4
Aggregate installed capacity[c]	0.9	—	3.0	—	—	—	3.9
Aggregate production[d]	1.9	—	8.1	—	—	—	10.0
Average plant factor[e]	24.1	—	30.8	—	—	—	29.3
1962 Number of stations	—	1	1	—	—	—	2
Aggregate installed capacity[c]	—	1.0	3.0	—	—	—	4.0
Aggregate production[d]	—	2.2	15.3	—	—	—	17.5
Average plant factor[e]	—	25.1	58.2	—	—	—	50.0
Western Samoa							
1962 Number of stations	2	1	—	—	—	—	3
Aggregate installed capacity[c]	0.3	1.0	—	—	—	—	1.3
Aggregate production[d]	1.2	3.7	—	—	—	—	4.9
Average plant factor[e]	45.7	42.2	—	—	—	—	43.0

[a] No data available for Australia and Mongolia.
No public hydro-electric stations in Brunei, Cambodia, Hong Kong, Laos, North Borneo (Sabah), Sarawak and Singapore, and Thailand.
No 1961 data available for Western Samoa.

[b] Relating to fiscal year ended 20 March of subsequent year and to power plants of installed capacity 100 kW and over, including self-supplying industrial plants.

[c] In thousand kW.

[d] In million kWh.

[e] Expressed by means of the following ratio in percentage:

$$\frac{\text{Aggregate kWh}}{\text{Aggregate kW} \times 8{,}760}$$

[f] Relating to fiscal year ended 30 September of the specified year.

[g] Relating to fiscal year ended 31 March of subsequent year.

[h] Relating to fiscal year ended 20 March of subsequent year.

[i] Excluding the generation of a 130 MW Dez dam running on test at the end of the year.

[j] Included in column (4).

Table 8 *(Cont'd)*

C. Diesel stations[a]

Country, year and item (1)		Installed capacity (kW) Up to 500 (2)	501 to 1,000 (3)	1,001 to 5,000 (4)	5,001 to 10,000 (5)	10,001 to 50,000 (6)	Total (7)
Afghanistan[b]							
1961	Number of stations	10	4	—	—	—	14
	Aggregate installed capacity[c]	3.0	3.0	—	—	—	6.0
	Aggregate production[d]	1.0	4.0	—	—	—	5.0
	Average plant factor[e]	38.0	15.2	—	—	—	9.5
1962	Number of stations	14	3	2	—	—	19
	Aggregate installed capacity[c]	2.8	2.4	2.5	—	—	7.7
	Aggregate production[d]	0.9	...	2.6	—	—	3.5
	Average plant factor[e]	3.7	...	11.8	—	—	5.2
Brunei							
1961	Number of stations	3	—	1	—	—	4
	Aggregate installed capacity[c]	0.5	—	2.7	—	—	3.2
	Aggregate production[d]	0.4	—	7.1	—	—	7.5
	Average plant factor[e]	9.1	—	30.0	—	—	26.7
1962	Number of stations	3	—	1	—	—	4
	Aggregate installed capacity[c]	0.5	—	3.8	—	—	4.3
	Aggregate production[d]	0.4	—	7.9	—	—	8.3
	Average plant factor[e]	9.1	—	23.7	—	—	22.0
Burma[f]							
1961	Number of stations	174	12	9	—	—	195
	Aggregate installed capacity[c]	19.6	8.1	21.0	—	—	48.7
	Aggregate production[d]	16.9	11.5	32.9	—	—	61.3
	Average plant factor[e]	9.9	16.2	17.9	—	—	14.4
1962	Number of stations	175	9	10	—	—	194
	Aggregate installed capacity[c]	16.8	7.0	24.4	—	—	48.2
	Aggregate production[d]	20.5	11.0	36.3	—	—	67.8
	Average plant factor[e]	14.0	17.9	17.0	—	—	16.0
Cambodia							
1961	Number of stations	47	2	2	—	1	52
	Aggregate installed capacity[c]	5.2	2.4	1.8	—	14.1	23.5
	Aggregate production[d]	6.5	3.5	2.9	—	53.4	66.3
	Average plant factor[e]	14.3	16.7	18.4	—	43.2	32.2
1962	Number of stations	50	7	7	—	1	65
	Aggregate installed capacity[c]	1.6	3.0	4.5	—	22.0	31.1
	Aggregate production[d]	2.4	4.5	6.6	—	60.6	74.1
	Average plant factor[e]	17.1	17.1	16.7	—	31.4	27.2
Ceylon							
1961	Number of stations	20	—	2	—	1	23
	Aggregate installed capacity[c]	6.0	—	5.7	—	15.0	26.7
	Aggregate generation[d]	12.0	—	15.4	—	5.0	32.4
	Average plant factor[e]	22.8	—	30.8	—	3.8	13.8
1962	Number of stations	18	—	2	—	1	21
	Aggregate installed capacity[c]	4.9	—	6.0	—	15.0	25.9
	Aggregate generation[d]	7.1	—	15.3	—	10.2	32.6
	Average plant factor[e]	16.6	—	29.1	—	7.8	14.4
China (Taiwan)							
1961	Number of stations	3	—	2	—	—	5
	Aggregate installed capacity[c]	0.4	—	4.5	—	—	4.9
	Aggregate generation[d]	0.6	—	5.7	—	—	6.3
	Average plant factor[e]	17.2	—	14.5	—	—	14.7
1962	Number of stations	1	—	2	—	—	3
	Aggregate installed capacity[c]	0.4	—	4.5	—	—	4.9
	Aggregate generation[d]	0.5	—	1.7	—	—	2.2
	Average plant factor[e]	14.3	—	4.3	—	—	5.1

Table 8 C (Cont'd)

Country, year and item (1)	Installed capacity (kW) Up to 500 (2)	501 to 1,000 (3)	1,001 to 5,000 (4)	5,001 to 10,000 (5)	10,001 to 50,000 (6)	Total (7)
Hong Kong						
1961 Number of stations	1	—	—	—	—	1
Aggregate installed capacity[c]	0.24	—	—	—	—	0.24
Aggregate generation[d]	0.3[g]	—	—	—	—	0.3[g]
Average plant factor[e]	14.25	—	—	—	—	14.25
1962 Number of stations	1	—	—	—	—	1
Aggregate installed capacity[c]	0.24	—	—	—	—	0.24
Aggregate generation[d]	0.3[g]	—	—	—	—	0.3[g]
Average plant factor[e]	14.25	—	—	—	—	14.25
India[h]						
1961 Number of stations	461	100	75	5	—	641
Aggregate installed capacity[c]	78.6	62.7	137.7	37.8	—	316.8
Aggregate generation[d]	74.1	75.0	168.4	62.2	—	379.7
Average plant factor[e]	10.8	13.7	14.0	16.8	—	13.7
1962 Number of stations	449	89	75	6	1	620
Aggregate installed capacity[c]	78.3	59.4	138.8	40.2	10.3	327.0
Aggregate generation[d]	63.1	75.8	180.2	39.4	24.9	383.4
Average plant factor[e]	9.2	14.6	14.9	11.2	27.6	13.4
Indonesia						
1961 Number of stations	...	...	...	...	...	...
Aggregate installed capacity[c]	...	...	...	...	...	118.0
Aggregate generation[d]	...	...	...	...	...	388.5
Average plant factor[e]	...	...	...	...	...	37.6
1962 Number of stations	...	...	...	...	...	146
Aggregate installed capacity[c]	...	...	...	...	...	141.7
Aggregate generation[d]	...	...	...	...	...	392.2
Average plant factor[e]	...	...	...	...	...	31.6
Iran[i]						
1961 Number of stations	...	...	...	...	...	...
Aggregate installed capacity[c]	...	...	...	...	...	189.0
Aggregate generation[d]	...	...	...	...	...	499.0
Average plant factor[e]	...	...	...	...	...	30.2
1962 Number of stations	...	...	...	...	...	...
Aggregate installed capacity[c]	...	...	...	...	...	194.0
Aggregate generation[d]	...	...	...	...	...	540.0
Average plant factor[e]	...	...	...	...	...	31.8
Japan[h]						
1961 Number of stations	37	7	10	—	—	54
Aggregate installed capacity[c]	5.0	5.0	24.0	—	—	34.0
Aggregate generation[d]	...	...	...	—	—	70.0
Average plant factor[e]	...	...	...	—	—	23.5
1962 Number of stations	26	10	1	—	—	37
Aggregate installed capacity[c]	10.0	23.0	6.0	—	—	39.0
Aggregate generation[d]	...	...	...	—	—	92.0
Average plant factor[e]	...	...	...	—	—	26.9
Korea, Republic of						
1961 Number of stations	4	1	—	—	—	5
Aggregate installed capacity[c]	0.5	0.8	—	—	—	1.3
Aggregate generation[d]	0.4	1.7	—	—	—	2.1
Average plant factor[e]	9.1	24.3	—	—	—	18.4
1962 Number of stations	4	1	—	1	2	4
Aggregate installed capacity[c]	0.4	0.8	—	6.3	30.5	38.0
Aggregate generation[d]	0.4	2.1	—	27.0	47.7	77.2
Average plant factor[e]	11.4	30.0	—	48.9	17.8	23.1

Table 8 C *(Cont'd)*

Country, year and item (1)	Installed capacity (kW) Up to 500 (2)	501 to 1,000 (3)	1,001 to 5,000 (4)	5,001 to 10,000 (5)	10,001 to 50,000 (6)	Total (7)
Laos						
1961 Diesel engines						
Number of stations	5	—	1	—	—	6
Aggregate installed capacity[c]	1.0	—	3.4	—	—	4.4
Aggregate generation[d]	1.6	—	6.0	—	—	7.6
Average plant factor[e]	18.3	—	20.1	—	—	19.7
Gas engines						
Number of stations	2	—	—	—	—	2
Aggregate installed capacity[c]	0.2	—	—	—	—	0.2
Aggregate generation[d]	0.4	—	—	—	—	0.4
Average plant factor[e]	22.8	—	—	—	—	22.8
Malaysia:						
Former Federation of Malaya						
1961 Number of stations	29	10	10	—	—	49
Aggregate installed capacity[c]	5.9	7.1	26.1	—	—	39.1
Aggregate generation[d]	12.6	13.6	65.8	—	—	92.0
Average plant factor[e]	24.4	21.9	28.8	—	—	26.9
1962 Number of stations	39	9	10	—	—	59
Aggregate installed capacity[c]	6.5	7.1	32.4	—	—	46.0
Aggregate generation[d]	13.8	14.6	89.3	—	—	117.7
Average plant factor[e]	24.3	23.5	31.5	—	—	29.3
North Borneo (Sabah)						
1961 Number of stations	...	...	...	—	—	...
Aggregate installed capacity[c]	...	...	...	—	—	9.8
Aggregate generation[d]	...	...	...	—	—	18.7
Average plant factor[e]	...	...	...	—	—	21.8
1962 Number of stations	6	2	2	—	—	10
Aggregate installed capacity[c]	1.2	2.0	6.0	—	—	9.2
Aggregate generation[d]	...	...	...	—	—	22.9
Average plant factor[e]	...	...	...	—	—	28.4
Sarawak						
1961 Number of stations	13	...	2	1	—	16
Aggregate installed capacity[c]	2.5	...	3.4	5.2	—	11.1
Aggregate generation[d]	3.1	...	6.4	14.1	—	23.6
Average plant factor[e]	14.2	...	21.5	30.8	—	24.3
1962 Number of stations	12	—	2	1	—	15
Aggregate installed capacity[c]	3.3	—	3.4	5.2	—	11.9
Aggregate generation[d]	3.6	—	7.0	16.5	—	27.2
Average plant factor[e]	12.5	—	23.5	36.5	—	26.1
Singapore[j]						
1961 Number of stations	—	—	—	—	1	1
Aggregate installed capacity[c]	—	—	—	—	36.0	36.0
Aggregate generation[d]	—	—	—	—	9.8	9.8
Average plant factor[e]	—	—	—	—	3.1	3.1
1962 Number of stations	—	—	—	—	1	1
Aggregate installed capacity[c]	—	—	—	—	36.0	36.0
Aggregate generation[d]	—	—	—	—	3.9	3.9
Average plant factor[e]	—	—	—	—	1.2	1.2
Nepal						
1961 Number of stations	4	—	1	—	—	5
Aggregate installed capacity[c]	1.3	—	1.7	—	—	3.0
Aggregate generation[d]	1.7	—	2.4	—	—	4.1
Average plant factor[e]	14.9	—	16.1	—	—	15.6

Table 8 C *(Cont'd)*

Country, year and item (1)		Installed capacity (kW) Up to 500 (2)	501 to 1,000 (3)	1,001 to 5,000 (4)	5,001 to 10,000 (5)	10,001 to 50,000 (6)	Total (7)
New Zealand[h]							
1961	Number of stations	5	1	3	1	—	10
	Aggregate installed capacity[c]	1.0	1.0	6.0	6.0	—	14.0
	Aggregate generation[d]	...	...	...	...	—	...
	Average plant factor[e]	...	...	...	...	—	...
1962	Number of stations	5	1	2	—	—	8
	Aggregate installed capacity[c]	1.0	1.0	4.0	—	—	6.0
	Aggregate generation[d]	...	...	...	—	—	...
	Average plant factor[e]	...	...	...	—	—	...
Pakistan							
1961	Number of stations	42	16	9	3	2	72
	Aggregate installed capacity[c]	8.4	12.7	15.5	28.6	29.1	94.3
	Aggregate generation[d]	9.0	17.8	41.8	76.2	75.5	220.3
	Average plant factor[e]	12.9	16.8	30.8	30.4	29.6	26.7
1962	Number of stations	48	18	9	3	2	80
	Aggregate installed capacity[c]	8.8	14.0	16.4	28.6	29.1	96.9
	Aggregate generation[d]	9.6	19.8	24.4	26.5	22.5	102.8
	Average plant factor[e]	12.5	16.1	17.0	10.6	8.8	12.1
Philippines							
1961	Number of stations	349	14	9	3	—	375
	Aggregate installed capacity[c]	31.3	10.0	17.5	15.4	—	74.2
	Aggregate generation[d]	42.0	19.5	34.0	40.8	—	136.3
	Average plant factor[e]	15.3	22.2	22.2	30.2	—	20.9
1962	Number of stations	358	19	10	3	—	390
	Aggregate installed capacity[c]	35.3	13.4	17.8	15.4	—	81.9
	Aggregate generation[d]	61.2	21.0	32.3	41.8	—	156.3
	Average plant factor[e]	19.8	17.9	20.7	30.9	—	21.8
Thailand							
1961	Number of stations	363	23	22	1	1	410
	Aggregate installed capacity[c]	31.9	17.4	47.5	9.0	23.7	129.5
	Aggregate generation[d]	27.4	21.9	87.3	12.8	55.8	205.2
	Average plant factor[e]	9.8	14.4	21.0	16.2	26.9	18.1
1962	Number of stations	389	21	23	2	1	436
	Aggregate installed capacity[c]	33.1	16.1	47.0	17.0	22.4	135.6
	Aggregate generation[d]	31.8	21.4	59.6	21.6	21.1	155.5
	Average plant factor[e]	11.7	15.2	14.5	14.5	10.8	13.1
Viet-Nam, Republic of							
1961	Number of stations	...	...	...	...	...	...
	Aggregate installed capacity[c]	...	...	...	...	...	49.2
	Aggregate generation[d]	...	...	...	...	...	101.9
	Average plant factor[e]	...	...	...	...	...	23.6
1962	Number of stations	39	7	8	1	1	56
	Average plant factor[e]	9.1	5.1	19.7	7.9	20.7	62.5
	Aggregate generation[d]	11.9	6.4	30.3	25.4	65.3	139.3
	Average plant factor[e]	14.9	14.3	17.5	36.7	36.0	25.5
Western Samoa							
1962	Number of stations	2	—	—	—	—	2
	Aggregate installed capacity[c]	0.6	—	—	—	—	0.6
	Aggregate generation[d]	0.8	—	—	—	—	0.8
	Average plant factor[e]	15.2	—	—	—	—	15.2

[a] No data available for Australia and Mongolia.
No 1961 data available for Western Samoa.
No 1962 data available for Nepal.

[b] Relating to fiscal year ended 20 March of subsequent year and to power plants of installed capacity 100 kW and over, including self-supplying industrial plants.

[c] In thousand kW.

[d] In million kWh.

[e] Expressed by means of the following ratio in percentage:

$$\frac{\text{Aggregate kWh}}{\text{Aggregate kW} \times 8{,}760}$$

[f] Relating to fiscal year ended 30 September of the specified year.

[g] Estimated.

[i] Relating to fiscal year ended 20 March of subsequent year.

[i] Relating to fiscal year ended 20 March of subsequent year.

[j] Free piston gas turbo-generating plant at St. James' power station; units running on experimental basis.

Table 9a: ELECTRICITY CONSUMPTION BY STATION AUXILIARIES AND TRANSMISSION AND DISTRIBUTION LOSSES, 1961 AND 1962[a]

Country and year (1)	Total generation at public utility power station (million kWh) (2)	Consumption by the station auxiliaries (million kWh) (3)	Energy purchased from non-utility stations and/or energy imported (million kWh) (4)	Energy losses in transmission and distribution (million kWh) (5)	Total energy sold (million kWh) (2)—(3)+(4)—(5) =(6) (6)
Australia					
1961	23,955.0	1,365.0	—	3,005.0	19,585.0
1962	25,453.0	1,471.0	—	2,224.0	21,758.0
Brunei					
1961	7.5	0.5	2.8	0.3	9.5
1962	8.3	0.5	2.8	0.5	10.1
Burma[b]					
1961	287.3	13.6[c]	—	67.4	207.3
1962	322.3	13.3	—	84.1	224.9
Cambodia					
1961	74.2	2.0	—	19.9	54.3
1962	79.8	2.9	—	16.8	60.1
Ceylon[e]					
1961	291.2	2.9	—	45.4	242.9
1962	331.8	4.2	—	55.8	271.8
China (Taiwan)					
1961	4,189.0	117.0	12.0	556.0	3,528.0
1962	4,846.9	163.0	8.8	627.7	4,065.0
Hong Kong					
1961	1,542.1	85.9	—	126.6	1,329.6[f]
1962	1,786.6	99.2	—	148.0	1,539.4[f]
India[g]					
1961	19,670.0	814.0	367.0	2,775.0	16,448.0
1962	22,364.8	913.0	469.0	3,245.8	18,675.0
Indonesia					
1961	1,220.0	157.7	—	175.5	886.8
1962	1,242.1	h	—	239.6	1,002.5
Japan[g]					
1961	116.809.0	3,470.0	—	11,849.0	101,490.0
1962	124,019.0	4,523.0	—	11,854.0	107,642.0
Korea, Republic of					
1961	1,772.9	89.3	—	494.2	1,189.4
1962	1,978.1	87.6	0.4	421.7	1,469.2
Laos					
1961	8.0	h	—	1.7	6.3
1962	9.4	h	—	2.3	7.1
Malaysia:					
Former Federation of Malaya					
1961	1,239.5	59.9	50.6[i]	129.5	1,100.7
1962	1,366.7	67.5	58.8[i]	82.0	1,276.0
North Borneo (Sabah)					
1961	18.5	0.3	—	1.7	16.5
1962	22.9	0.3	—	2.2	20.4
Sarawak[j]					
1961	23.0	0.7	—	3.4	18.9
1962	26.6	0.8	—	3.4	22.4
Singapore					
1961	719.6	32.4	—	50.6	636.6[k]
1962	775.7	35.5	—	50.7	689.5[k]

Table 9a *(Cont'd)*

Country and year (1)	Total generation at public utility power station (million kWh) (2)	Consumption by the station auxiliaries (million kWh) (3)	Energy purchased from non-utility stations and/or energy imported (million kWh) (4)	Energy losses in transmission and distribution (million kWh) (5)	Total energy sold (million kWh) (2)—(3)+(4)—(5) =(6) (6)
Nepal					
1961	10.9	1.1	—	2.1	7.7
1962	12.6	1.3	—	2.5	8.8
New Zealand[g]					
1961	7,399.0	79.0	—	1,151.0	6,169.0
1962	7,951.0	77.0	—	1,190.0	6,684.0
Pakistan					
1961	1,818.9	74.2	—	459.4	1,285.3
1962	2,307.5	94.9	—	496.9	1,715.7
Philippines					
1961	2,555.3	h	—	355.0	2,200.3
1962	3,010.1	h	—	480.6	2,529.4
Thailand					
1961	601.8	38.5	10.1	106.9	466.5
1962	700.3	42.2	8.9	123.4	543.6
Viet-Nam, Republic of					
1961	328.6	17.8	—	39.7	271.0
1962	374.9	21.9	—	45.1	307.9
Western Samoa					
1962	5.7	h	—	1.2	4.5

[a] No data available for Afghanistan, Iran and Mongolia. No 1961 data available for Western Samoa.

[b] Relating to fiscal year ended 30 September of the specified year.

[c] Including 1.5 million kWh consumed in residential quarters of Electricity Supply Board (Hydel).

[d] Including only government-owned power station.

[e] Relating only to Department of Government Electrical Undertakings.

[f] Including consumption by Hong Kong Electric Company Ltd. premises, 2.2 million kWh for the year 1961 and 2.4 million kWh for the year 1962.

[g] Relating to fiscal year ended 31 March of subsequent year.

[h] Included in column (5).

[i] Purchase from Singapore.

[j] Relating to Sarawak Electricity Supply Co., Ltd. only.

[k] Including sales to the former Federation of Malaya.

Table 9b: ELECTRICITY CONSUMPTION (IN MILLION KWH) AND NUMBER OF CONSUMERS BY CATEGORIES OF UTILIZATION, 1961 AND 1962[a]

Country, item and year (1)		Domestic and residential uses (2)	Supply for commercial and business purposes (3)	Industrial loads including traction, water-works etc. (4)	Street lighting (5)	Others (6)	Total (7)
Brunei							
1961	Electricity consumption . .	8.6	b	0.5	0.4	—	9.5
	Number of consumers . . .	6,469	b	2			
1962	Electricity consumption . .	9.2	b	0.6	0.4	—	10.1
	Number of consumers . . .	7,146	b	2			
Burma[c]							
1961	Electricity consumption . .	31.5	8.4	d	11.3	—	51.2
	Number of consumers . . .	151,577	2,381	d			
1962	Electricity consumption . .	38.0	b	10.6	9.3	—	57.9
	Number of consumers . . .	160,231	b	2,817			
Cambodia							
1961	Electricity consumption . .	30.2	9.8	—	2.0	0.1	42.1
	Number of consumers . . .	23,385	2,216	—			
1962	Electricity consumption . .	33.2	4.2	6.9	2.1	0.2	46.6
	Number of consumers . . .	25,000	2,000	2,100			
Ceylon[e]							
1961	Electricity consumption . .	39.2	55.0	83.2	2.8	62.7	242.9
	Number of consumers . . .	24,136	10,034	1,325			
1962	Electricity consumption . .	40.2	54.6	111.7	3.0	62.3	271.8
	Number of consumers . . .	25,928	10,621	864			
China (Taiwan)							
1961	Electricity consumption . .	500.0	131.0	2,849.0	23.0	25.0	3,528.0
	Number of consumers . . .	1,031,240	145,455	37,101			
1962	Electricity consumption . .	564.0	138.0	3,310.0	27.0	26.0	4,065.0
	Number of consumers . . .	1,128,800	156,115	41,387			
Hong Kong							
1961	Electricity consumption . .	837.8	b	483.0	8.8	—	1,329.6
	Number of consumers . . .	291,012	b	34[f]			
1962	Electricity consumption . .	978.8	b	530.3	10.3	—	1,539.4
	Number of consumers . . .	325,143	b	35[f]			
India[g]							
1961	Electricity consumption . .	1,698.1	4.1	12,609.5	215.5	991.1	16,448.3
	Number of consumers . . .	4,153,869	770,082	190,149			
1962	Electricity consumption . .	1,916.8	1,048.4	14,362.1	244.6	1,103.5	18,675.4
	Number of consumers . . .	4,303,230	913,760	210,588			
Indonesia							
1961	Electricity consumption . .	601.9	250.6	d	34.3	—	886.8
1962	Electricity consumption . .	772.4	b	230.1	b	b	1,002.5
	Number of consumers . . .	754,543	8,263	d			
Japan[g]							
1961	Electricity consumption . .	12,533.0	6,304.0	79,965.0	314.0	2,374.0	101,490.0
	Number of consumers . . .	18,724,850	452,554	1,808,478			
1962	Electricity consumption . .	15,503.0	7,605.0	82,767.0	316.0	1,406.0	107,642.0
	Number of consumers . . .	19,512,313	524,131	1,963,596			
Korea, Republic of							
1961	Electricity consumption . .	193.5	304.4	645.5	5.6	40.4	1,189.4
	Number of consumers . . .	763,214	7,803	24,959			
1962	Electricity consumption . .	247.5	166.0	1,034.1	6.3	15.3	1,469.2
	Number of consumers . . .	843,930	25,837	2,037			

Table 9b *(Cont'd)*

Country, item and year (1)	Domestic and residential uses (2)	Supply for commercial and business purposes (3)	Industrial loads including traction, water-works etc. (4)	Street lighting (5)	Others (6)	Total (7)
Laos						
1961 Electricity consumption . .	5.8	b	—	0.5	—	6.3
Number of consumers . . .	6,359	b	—			
1962 Electricity consumption . .	4.1	b	—	b	3.0	7.1
Number of consumers . .	7,548	—	—			
Malaysia:						
Former Federation of Malaya						
1961 Electricity consumption . .	139.0	201.3	715.1	14.1	31.2	1,100.7
Number of consumers . . .	293,594	603	886			
1962 Electricity consumption . .	144.1	216.7	778.9	14.8	121.5	1,276.0
Number of consumers . . .	282,103	b	938			
North Borneo (Sabah)						
1961 Electricity consumption . .	5.6	7.3	3.3	0.3	—	16.5
Number of consumers . . .	5,863	2,157	49			
1962 Electricity consumption . .	5.9	9.9	4.3	0.3	—	20.4
Number of consumers . . .	5,883	2,929	58			
Sarawak						
1961 Electricity consumption . .	8.7	8.0	d	0.5	1.7	18.9
Number of consumers . . .	14,004	b	b			
1962 Electricity consumption . .	9.9	8.1	2.9	0.7	0.8	22.4
Number of consumers . . .	14,956	2,073	115			
Singapore[h]						
1961 Electricity consumption . .	318.3	306.3	d	12.0	—	636.6
Number of consumers . . .	106,530	b	b			
1962 Electricity consumption . .	345.4	331.2	d	12.9	—	689.5
Number of consumers . . .	118,663	b	b			
Nepal						
1961 Electricity consumption . .	4.9	2.5	d	0.3	—	7.7
Number of consumers . . .	16,950	500	d			
1962 Electricity consumption . .	8.1	0.4	d	0.3	—	8.8
Number of consumers . . .	16,950	510	d			
New Zealand						
1961 Electricity consumption . .	3,656	659	1,582	48	224	6,169
Number of consumers . . .	747,778	111,905	d			
1962 Electricity consumption . .	3,920	668	1,816	58	222	6,684
Number of consumers . . .	786,116	116,039	d			
Pakistan						
1961 Electricity consumption . .	271.9	65.2	846.7[i]	14.7	86.8	1,285.3
1962 Electricity consumption . .	276.6	126.4	990.4	23.5	298.8	1,715.7
Philippines						
1961 Electricity consumption . .	1,298.3	b	902.0	b	b	2,200.3
Number of consumers . . .	970,571	b	916			
1962 Electricity consumption . .	1,472.2	—	1,057.2	—	—	2,529.4
Number of consumers . . .	778,408	—	946			

Table 9b *(Cont'd)*

Country, item and year (1)		Domestic and residential uses (2)	Supply for commercial and business purposes (3)	Industrial loads including traction, water-works etc. (4)	Street lighting (5)	Others (6)	Total (7)
Thailand							
1961	Electricity consumption . .	181.2	96.8	171.3	13.9	3.3	466.5
	Number of consumers . . .	387,161	34,174	23,686			
1962	Electricity consumption . .	295.1	[b]	232.2	15.0	1.3	543.6
	Number of consumers . . .	450,505	[b]	35,962			
Viet-Nam, Republic of							
1961	Electricity consumption . .	163.4	58.6	36.2	8.5	4.3	271.0
	Number of consumers . . .	101,389	7,796	626			
Western Samoa							
1961	Electricity consumption . .	3.1	0.9	—	[d]	—	4.0
1961	Electricity consumption . .	3.4	1.1	—	[d]	—	4.5
	Number of consumers . . .	2,075	17	—			

[a] No data available for Afghanistan, Australia, Iran and Mongolia.

No 1962 data available for Republic of Viet-Nam.

[b] Included in column (2).

[c] Relating to fiscal year ended 30 September of specified year and only to Electricity Supply Board (Electrical and Mechanical Department).

[d] Included in column (3).

[e] Relating only to Department of Government Electrical Undertakings.

[f] Relating to Hong Kong island only, figure for Kowloon included in column (2).

[g] Relating to fiscal year ended 31 March of subsequent year.

[h] Including sales to the Federation of Malaya, 55.2 million kWh for the year 1961 and 58.8 million kWh for the year 1962.

[i] Including industrial, agricultural and railways consumption.

Table 10: PUBLIC ELECTRICITY SUPPLY IN RELATION TO AREA AND POPULATION OF COUNTRIES, 1961 AND 1962

Country and year (1)	Population (thousand) (2)	Area (square kilo-)* metres) (3)	Installed capacity: Kilowatts per thousand population (4)	Installed capacity: Kilowatts per square kilometres (5)	Production: Kilowatt-hours per capita (5)	Production: Kilowatt-hours per square kilometre (7)	Consumption (kilowatt-hours per capita) (8)
Total for 22 countries of ECAFE region[a]							
1961	947,930.7	19,042,782	43.4	2.16	196.0	9,750	172.0[b]
1962	969,504.8	19,042,800	47.4	2.42	206.8	10,530	180.5[b]
Afghanistan[c]							
1961	13,800	640,000	4.3	0.09	8.9	192	...
1962	14,684	640,000	4.1	0.09	10.9	251	...
Australia[d]							
1961	10,508	7,695,008	634.3	0.87	2,280.0	3,113	1,864.0
1962	10,705	7,695,008	674.0	0.94	2,378.0	3,308	2,033.0
Brunei							
1961	84	5,767	38.6	0.56	122.6	1,786	113.1
1962	84	5,767	50.8	0.74	132.6	1,930	120.0
Burma[e]							
1961	21,916	681,170	8.7	0.28	15.0	421	9.4
1962	22,342	681,170	8.6	0.28	14.5	473	10.1
Cambodia							
1961	5,335	181,000	5.0	0.15	13.9	410	10.1
1962	5,749[f]	181,000	5.9	0.19	14.3	455	10.4
Ceylon							
1961	10,167	65.610	9.3	1.44	30.6	4,740	23.9
1962	10,442	65,610	11.3	1.81	33.6	5,350	26.0
China (Taiwan)							
1961	10,971	35,961	84.2	25.7	372.0	113,559	322.0
1962	11,327	35,961	81.5	25.7	414.0	130.493	359.0
Hong Kong							
1961	3,128	1,013	116.6	360.0	493.0	1,522,000	425.0
1962	3,225	1,031	150.5	471.0	554.0	1,730,000	477.0
India[g]							
1961	447,000	3,262,874	11.2	1.54	44.8	6,150	36.8
1962	457,000	3,262,874	12.6	1.77	49.8	6,980	40.8
Indonesia							
1961	95,128	1,482,394	3.3	0.21	12.8	824	9.3
1962	96,320	1,482,394	3.7	0.24	12.9	838	10.4
Iran[h]							
1961	21,500	1,630,000	16.5	0.22	43.7	576	...
1962	21,619	1,630,000	22.7	0.30	46.2	613	...
Japan[g]							
1961	94,050	369,700	242.0	61.60	1,240.0	315,956	1,080.0
1962	94,930	369,700	269.0	69.00	1,308.0	335,000	1,130.0
Korea, Republic of							
1961	24,925	98,431	14.7	3.73	71.1	18,011	47.7
1962	26,278	98,431	16.5	4.41	75.3	20,100.4	55.9
Laos							
1961	2,336	236,800	2.0	0.02	3.43	33.9	2.7
1962	2,453	236,800	1.9	0.02	3.84	39.7	2.9
Malaysia:							
Former Federaiton of Malaya							
1961	7,139	131,313	44.2	2.4	181.5	9,850	166.5
1962	7,601	131,313	40.1	2.3	187.5	11,300	168.0

Table 10 *(Cont'd)*

Country and year (1)	Population (thousand) (2)	Area (square kilo-) metres) (3)	Installed capacity: Kilowatts per thousand population (4)	Installed capacity: Kilowatts per square kilometres (5)	Production: Kilowatt-hours per capita (5)	Production: Kilowatt-hours per square kilometre (7)	Consumption (kilowatt-hours per capita) (8)
North Borneo (Sabah)							
1961	450	75,000	21.8	0.13	41.5	249	36.7
1962	450	75,000	20.3	0.12	51.0	305	45.0
Sarawak							
1961	780	124,000	14.2	0.09	30.3	190.5	24.3[i]
1962	800	124,000	14.9	0.10	34.0	219	25.0[i]
Singapore							
1961	1,712	581	110.0	323.00	388	1,143,000	372
1962	1,755.5	581	121.0	366.00	408	1,233,000	393
Nepal							
1961	9,500	128,000	0.7	0.05	1.15	85.5	0.8
1962	9,500	128,000	0.77	0.06	1.33	98.5	0.93
New Zealand[g]							
1961	2,420	265,000	7,500.0	6.85	3,055.0	27,900	2,550.0
1962	2,533	265,000	7,677.0	7.34	3,139.0	30,005	2,638.0
Pakistan							
1961	94,601	946,000	7.27	0.73	19.23	1,923	13.6
1962	97,102	946,000	8.64	0.89	23.76	2,440	17.7
Philippines							
1961	28,665.7	299,404	22.7	2.18	89.5	8,534.6	76.7
1962	29,577.3	299,404	22.35	2.21	101.8	10,053.5	85.5
Thailand							
1961	27,181	514,000	9.7	0.51	22.5	1,190.4	17.2
1962	28,000	514,000	9.7	0.53	25.3	1,379.8	19.4
Viet-Nam, Republic of							
1961	14,520	170,806	7.0	0.60	22.7	1,925	18.7
1962	14,929	170,806	7.8	0.67	25.2	2,190	20.6
Western Samoa							
1961	114	2,950	16.5	0.66	43.8	1,660	35.1
1962	117	2,950	16.2	0.66	48.8	1,930	38.5

[a] Figures obtained from national sources or from United Nations Economic Survey of Asia and the Far East 1962, Sales Number:63.II.F.1 and United Nations Monthly Bulletin of Statistics (November 1963).
No data available for Mongolia.

[b] Excluding Afghanistan, Iran and Mongolia owing to non-availability of data; 1961 figure also excludes Western Samoa.

[c] Relating to fiscal year ended 20 March of subsequent year and to power plants of installed capacity 100 kW and over, including self-supplying industrial plants.

[d] Relating to fiscal year ended 30 June of the specified year.

[e] Relating to fiscal year ended 30 September of the specified year.

[f] Census.

[g] Relating to fiscal year ended 31 March of subsequent year.

[h] Relating to fiscal year ended 20 March of subsequent year.

[i] Relating to Sarawak Electricity Supply Co., Ltd. only.

Table 11: Installed Capacity and Generation of Industry-owned Plants, 1961 and 1962[a]

Country and year (1)	Installed capacity (thousand kW) (2)	Electric energy (million kWh): Generated in industry-owned plants (3)	Purchased from public supply power stations (4)	Sold to outside agencies (5)	Consumed by the industry (6)=(3)+(4)—(5)
Australia					
1961	...	858.9	...	...	...
1962	...	821.9	...	...	...
Brunei					
1961	17.9	52.0	—	2.8	49.2
1962	15.8	51.1	—	2.8	48.3
Cambodia					
1961	1.2	1.4	—	—	1.4
1962	1.2	1.8	—	—	1.8
Ceylon					
1961	8.1	23.1	—	—	23.1
1962	8.1	20.8	—	—	20.8
China (Taiwan)					
1961	78.1	171.0	2,866.2	11.9	3,025.3
1962	75.0	164.0	3,328.0	9.0	3,483.0
India[b]					
1961	1,012.0	3,288.0	7,047.0	290.0	10,043.0
1962	1,125.0	3,863.0	8,041.0	844.0	11,060.0
Indonesia					
1961	77.0	142.6	110.7	19.9	233.4
Iran					
1961	320.0	1,150.0	—	—	1,150.0
1962	320.0	1,150.0	—	—	1,150.0
Japan[b]					
1961	3,201.9	15,213.4	66,229.7	2,127.0	79,316.1
1962	3,638.0	16,364.0	67,470.0	489.0	83,345.0
Korea, Republic of					
1961	111.0	66.6	390.0	—	456.6
1962	119.0	198.0	254.0	0.4	451.6
Malaysia:					
Former Federation of Malaya					
1961	...	75.7	582.1	—	657.8
1962					
Sarawak					
1961	7.4	19.5	—	—	19.5
1962	7.4	19.6	—	—	19.6
Singapore[c]					
1961	12.3	...	...	—	...
Philippines					
1961	204.3	540.0	—	—	540.0
1962	208.3	670.4	1,057.2	—	1,727.6
Thailand[d]					
1961	19.7	72.0[e]	—	12.5[e]	59.5[e]
1962	20.2	74.9[f]	1.1	12.5[f]	63.5[f]

[a] No data available for Afghanistan, Burma, Hong Kong, Laos, North Borneo (Sabah), Mongolia, Nepal, New Zealand, Pakistan and Republic of Viet-Nam.
The industry-owned plants in Western Samoa are negligible.
No 1962 data available for Indonesia, the former Federation of Malaya and Singapore

[b] Relating to fiscal year ended 31 March of subsequent year.

[c] Plants mostly maintained by respective owners as standby.

[d] Including only major plants, viz. cement mills, Royal State Railway machine tool shops, Port Authority and Thai Pulp and Paper Mill.

[e] Excluding State Railway in Nakorn Srithamraj and cement mill in Nakorn Sawan.

[f] Excluding cement mill in Nakorn Sawan.

Table 12: Electricity Generation and Consumption in Selected Industries and by other Large Consumers of Power, 1961 and 1962[a]

Industry (1)	No. of factories (2)	Capacity of industry-owned plant (thousand kW) (3)	Electric energy (million kWh): Generated in industry-owned plant (4)	Purchased from public supply power station (5)	Sold to outside agencies (6)	Consumed by the industry (7) =(4)+(5)−(6)
			Brunei (1962)			
Oil production	1	15.8	51.1	—	2.8	48.3
			Cambodia (1961)			
Total	10	1.2	1.4	—	—	1.4
			Ceylon (1961)			
Cement	1	3.7	11.6	—	—	11.6
Plywood	1	0.5	0.7	—	—	0.7
Paper	1	1.6	4.6	—	—	4.6
Chemicals	1	2.3	6.2	—	—	6.2
Total	4	8.1	23.1	—	—	23.1
			(1962)			
Cement	1	3.7	12.0	—	—	12.0
Plywood	1	0.5	0.8	—	—	0.8
Paper	1	1.6	5.0	—	—	5.0
Chemicals	1	2.3	3.0	—	—	3.0
Total	4	8.1	20.8	—	—	20.8
			China (Taiwan) (1961)			
Textiles	1,066	0.3	0.8	189.8	—	190.6
Metal	2,758	—	—	50.1	—	50.1
Aluminium	1	1.6	1.3	220.4	—	221.7
Iron and steel	43	—	—	302.7	—	302.7
Machinery and tools	1,333	0.6	0.2	64.9	—	65.1
Ceramics	1,176	0.7	—	25.2	—	25.2
Cement	15	16.9	74.8	124.7	4.7	194.8
Chemicals	2,726	2.3	5.2	125.7	—	130.9
Fertilizers	37	—	—	6691	—	669.1
Alkali	33	0.5	2.2	151.7	—	153.9
Papers	128	3.6	2.4	188.6	1.6	189.4
Sawmills	1,698	0.6	0.8	26.3	—	27.1
Printing	768	—	—	5.9	—	5.9
Food manufacture	11,961	1.4	3.0	220.6	—	223.6
Sugar	51	42.3	75.8	10.7	2.3	84.2
Miscellaneous	910	—	—	10.7	—	10.7
Mining	69	1.1	0.2	69.6	—	69.8
Collieries	218	1.9	0.3	123.0	—	123.3
Others	12,110	4.3	4.0	286.5	3.3	287.2
Total	37,101	78.1	171.0	2,866.2	11.9	3,025.3
			(1962)			
Textiles	1,098	0.3	0.9	224.1	—	225.0
Metal	2,891	—	—	54.4	—	54.4
Aluminium	1	1.6	2.1	273.8	—	275.9
Iron and steel	46	—	—	317.6	—	317.6
Machinery and tools	1,417	0.6	0.2	72.2	—	72.4
Ceramics	1,313	0.6	—	30.0	—	30.0
Cement	15	16.9	81.8	174.6	4.7	251.7
Chemicals	3,073	1.3	5.2	199.1	—	204.3
Fertilizers	43	—	—	751.3	—	751.3
Alkali	36	0.5	2.6	161.1	—	163.7
Papers	138	3.6	—	195.1	—	195.1
Sawmills	1,787	0.5	0.6	33.8	—	34.4
Printing	794	—	—	6.5	—	6.5
Food manufacture	13,061	3.5	5.8	241.5	—	247.3

Table 12 *(Cont'd)*

Industry (1)	No. of factories (2)	Capacity of industry-owned plant (thousand kW) (3)	Electric energy (million kWh): Generated in industry-owned plant (4)	Purchased from public supply power station (5)	Sold to outside agencies (6)	Consumed by the industry (7) =(4)+(5)—(6)
			China (Taiwan): (1962)—*(Contd.)*			
Sugar	49	37.9	60.8	10.0	0.9	69.9
Miscellaneous	952	0.0	—	10.9	—	10.9
Mining	76	1.3	—	75.1	—	75.1
Collieries	226	1.8	0.3	141.6	—	141.9
Others	14,371	4.7	3.5	355.5	3.2	355.8
TOTAL	41,387	75.2	163.8	3,328.2	8.8	3,483.2
			India (1961)			
Aluminium (primary)	4	11	78	364	—	442
Cement	50	88	475	518	10	983
Chemicals	32	58	331	275	1	605
Collieries	143	33	169	277	3	443
Copper (primary)	1	—	9	30	—	39
Cotton textiles	331	133	330	1,955	13	2,272
Fertilizers	6	81	410	918	34	1,294
Industrial (primary)	7	298	962	919	193	1,688
Iron and steel (secondary)	39	2	4	317	1	320
Jute	76	24	43	429	1	471
Oil and petroleum	5	4	16	62	—	78
Paper	23	70	306	252	32	526
Silk-textiles	18	1	7	153	—	160
Soap	10	—	—	26	—	26
Sugar	99	90	143	18	2	159
Tanneries	8	1	1	18	—	19
Wool	10	4	4	34	—	38
Others	...	114	—	482	—	482
TOTAL	...	1,012	3,288	7,047	290	10,045
			(1962)			
Aluminium (primary)	4	11	80	500	—	580
Cement	50	127	433	588	4	1,017
Chemicals	34	83	470	327	355	442
Collieries	148	160	431	284	231	484
Copper (primary)	1	9	10	30	—	40
Cotton textiles	328	147	309	2,075	9	2,375
Fertilizers	5	81	443	1,171	11	1,603
Iron and steel (secondary)	39	2	2	345	1	346
Iron and steel (primary)	7	301	1,170	1,114	208	2,076
Jute	76	23	59	589	2	646
Oil and petroleum	5	4	17	64	—	81
Paper	23	75	289	239	22	506
Silk	19	1	8	157	—	165
Soap	10	—	—	25	—	25
Sugar	98	89	146	20	1	165
Tanneries	8	—	—	17	—	17
Wool	10	4	5	30	—	35
TOTAL	756	1,117	3,872	7,575	844	10,603
			Indonesia[b] (1961)			
Food	489	3.8	1.6	3.0	—	4.6
Textiles	443	17.9	6.0	6.5	—	12.5
Paper and paper products	33	2.3	1.3	0.6	—	1.9
Printing, publishing and allied industries	224	3.8	0.4	1.2	—	1.6
Tanneries	92	1.4	0.3	0.9	—	1.2
Fertilizers	1	—	—	0.1	—	0.1
Sugar	25	1.3	1.5	2.4	—	3.9
Cement	2	4.4	43.3	—	—	43.3
Ceramics	8	0.4	0.4	—	—	0.4
Machinery and tools	52	0.9	0.2	2.5	—	2.7
TOTAL	1,369	36.2	55.0	17.2	—	72.2

Table 12 *(Cont'd)*

Industry (1)	No. of factories (2)	Capacity of industry-owned plant (thousand kW) (3)	Electric energy (million kWh) Generated in industry-owned plant (4)	Purchased from public supply power station (5)	Sold to outside agencies (6)	Consumed by the industry (7) =(4)+(5)—(6)
		Iran (1961)				
Oil	1	140	...	...	...	...
		(1962)				
Oil	1	140	...	...	...	...
		Japan[c] (1961)				
Agriculture	11	...	1.4	47.7	—	49.1
Mining, metal	81	...	169.2	794.8	—	964.0
„ , coal	186	...	451.3	2,685.0	—	3,136.3
„ , others	39	...	—	175.5	—	175.5
Construction	150	...	—	731.4	—	731.4
Food	182	...	82.8	786.5	—	869.3
Textile	420	...	1,080.2	4,100.4	—	5,180.5
Wooden products	20	...	—	95.9	—	95.9
Pulp and paper	237	...	1,791.6	5,085.5	—	6,879.2
Printing	24	...	—	99.3	—	99.3
Ammonium	21	...	722.4	5,144.9	—	5,867.3
Soda	33	...	537.6	2,301.6	—	2,839.1
Carbide	18	...	510.9	4,939.2	—	5,450.2
Salt	16	...	7.1	283.4	—	290.5
Other chemicals	244	...	285.6	3,344.7	—	3,630.3
Oil refinery	31	...	186.0	391.7	—	577.6
Rubber product	100	...	—	522.9	—	522.9
Glass	36	...	13.0	396.5	—	409.4
Cement	44	...	1,455.8	1,704.9	—	3,160.7
Carbon products	17	...	—	591.8	—	591.8
Other ceramics	72	...	37.7	404.2	—	441.8
Iron and steel	550	...	2,942.6	15,191.2	—	18,133.8
Non-ferro metal	38	...	380.2	1,201.2	—	1,581.4
Aluminium	10	...	935.6	2,682.4	—	3,618.0
Cable and wire	39	...	—	372.1	—	372.1
Other metal	78	...	—	638.2	—	638.2
Metal products	110	...	—	250.2	—	250.2
Machinery, general	172	...	9.3	957.9	—	967.2
Electric machinery	176	...	—	1,346.4	—	1,346.4
Automobile and parts	114	...	—	847.4	—	847.4
Shipbuilding	63	...	—	596.2	—	596.2
Other transportations	43	...	—	222.0	—	222.0
Metering equipment	17	...	—	39.5	—	39.5
Other products	69	...	—	251.6	—	251.6
Government railway	79	...	1,481.7	1,458.9	—	2,940.6
Private railway	87	...	—	2,488.0	—	2,488.0
Communication	49	...	—	159.3	—	159.3
Other public services	23	...	—	35.9	—	35.9
Gas supply	30	...	—	704.2	—	704.2
Water supply	100	...	—	757.2	—	757.2
Others	439	...	4.7	1,399.8	—	1,404.5
TOTAL	4,268	...	13,086.4	66,229.7	—	79,316.1
		(1962)				
Agriculture	8	...	2.5	47.4	—	49.9
Mining, metal	79	...	171.7	819.2	—	990.9
„ , coal	167	...	553.6	2,680.6	—	3,234.2
„ , others	38	...	—	164.1	—	164.1
Construction	140	...	—	797.4	—	797.4
Food	197	...	113.2	943.8	—	1,057.0
Textile	434	...	1,187.0	4,063.9	—	5,250.9
Wooden products	23	...	—	111.2	—	111.2
Pulp and paper	241	...	1,939.4	5,379.0	—	7,318.4
Printing	27	...	—	113.4	—	113.4
Ammonium	23	...	631.1	4,790.4	—	5,421.5
Soda	31	...	677.8	2,268.9	—	2,946.7
Carbide	17	...	504.0	4,536.8	—	5,040.8
Salt	14	...	8.6	244.5	—	253.1

Table 12 *(Cont'd)*

Industry (1)	No. of factories (2)	Capacity of industry-owned plant (thousand kW) (3)	Electric energy (million kWh): Generated in industry-owned plant (4)	Purchased from public supply power station (5)	Sold to outside agencies (6)	Consumed by the industry (7) =(4)+(5)—(6)
		Japan (1962)—*(Contd.)*				
Other chemicals	278	...	423.7	4,006.4	—	4,430.1
Oil refinery	29	...	237.3	416.1	—	653.4
Rubber products	104	...	—	599.3	—	599.3
Glass	41	...	12.7	453.8	—	466.5
Cement	46	...	1,486.2	1,957.8	—	3,444.0
Carbon products	21	...	—	611.6	—	611.6
Other ceramics	83	...	96.0	420.9	—	616.9
Iron and steel	570	...	3,289.2	14,127.2	—	17,416.4
Non-ferro metal	37	...	361.0	1,292.5	—	1,653.5
Aluminium	10	...	901.3	2,925.6	—	3,826.9
Cable and wire	42	...	—	378.6	—	378.6
Other metal	87	...	—	692.5	—	692.5
Metal products	122	...	—	271.3	—	271.3
Machinery, general	201	...	11.4	1,044.3	—	1,055.7
Electric machinery	190	...	—	1,450.6	—	1,450.6
Automobile and parts	127	...	—	984.2	—	984.2
Shipbuilding	62	...	—	519.1	—	519.1
Other transportations	48	...	—	217.2	—	217.2
Metering equipment	20	...	—	51.2	—	51.2
Other products	84	...	—	294.8	—	294.8
Government railway	91	...	1,517.4	1,698.2	—	3,215.6
Private railway	85	...	—	2,667.9	—	2,667.9
Communications	49	...	—	181.5	—	181.5
Other public service	24	...	—	37.8	—	37.8
Gas supply	29	...	—	699.6	—	699.6
Water supply	107	...	—	854.3	—	854.3
Others	526	...	4.6	1,653.2	—	1,657.8
TOTAL	4,553	...	14,129.7	67,470.3	—	81,600.0
		Korea, Republic of (1961)				
Collieries and other types of mining	18	4.5	2.7	19.5	—	22.2
Food	12	4.5	2.7	8.2	—	10.9
Textiles	26	16.7	10.0	76.1	—	86.1
Sawmills	6	1.6	0.9	1.9	—	2.8
Chemicals	21	3.5	2.1	36.2	—	38.3
Paper	9	1.6	0.9	39.1	—	40.0
Fertilizers	2	22.5	13.5	0.04	—	13.54
Cement	3	13.1	8.6	16.1	—	24.7
Machinery	20	3.8	2.8	14.5	—	17.3
Ceramics	1	0.4	0.26	1.9	—	2.16
TOTAL	118	72.2	44.46	213.54	—	258.0
		(1962)				
Collieries and other types of mines	15	1.2	0.1	113.3	—	113.4
Sugar	3	2.1	4.0	4.2	—	8.2
Food	9	1.1	0.4	20.6	—	21.0
Cotton	15	14.7	17.8	101.6	—	119.4
Woollen textile	1	3.7	1.2	7.5	—	8.7
Sawmills	1	0.4	0.1	2.6	—	2.7
Papers	9	1.3	0.3	81.2	—	81.5
Printing	1	—	—	1.1	—	1.1
Tanneries	1	—	—	0.2	—	0.2
Fertilizers	2	22.7	110.6	0.6	—	111.2
Soap	1	0.3	0.04	0.03	—	0.07
Other chemicals	13	2.9	0.8	—	—	0.8
Cement	2	11.0	57.6	40.2	—	97.8
Ceramics	1	—	—	2.3	—	2.3
Aluminium	1	—	—	0.1	—	0.1
Iron and steel (primary)	8	2.4	0.5	21.8	—	22.3
Machine tool	5	0.5	0.1	5.3	—	5.4
Manufacture of iron and steel	6	—	—	14.6	—	14.6
Railways	3	—	—	24.2	—	24.2
TOTAL	97	64.3	193.54	441.43	—	634.97

Table 12 *(Cont'd)*

Industry (1)	No. of factories (2)	Capacity of industry-owned plant (thousand kW) (3)	Electric energy (million kWh) Generated in industry-owned plant (4)	Purchased from public supply power station (5)	Sold to outside agencies (6)	Consumed by the industry (7) =(4)+(5)−(6)
			Malaysia			
Former Federation of Malaya (1961)						
Tin mining						
Dredging	...	...	14.1	277.7	—	291.8
Open cast	...	...	22.9	271.0	—	293.9
Underground	...	...	20.5	—	—	20.5
Iron mining	...	...	10.1	4.1	—	14.2
Coal mining	...	...	—	0.9	—	0.9
Gold mining	...	...	8.1	—	—	8.1
Cement	...	...	—	28.4	—	28.4
TOTAL	...	...	75.7	582.1	—	657.8
Singapore (1961)						
Other types of mines	2	—	—	0.34	—	0.34
Food manufacturing industries	3	—	—	0.59	—	0.59
Food and drink manufacturing and distributing industries	8	—	—	6.52	—	6.52
Breweries	2	—	—	5.54	—	5.54
Cotton textiles	1	—	—	1.89	—	1.89
Sawmills	8	—	—	0.75	—	0.75
Printing, publishing and allied industries	6	—	—	3.16	—	3.16
Soap including edible oil mills	5	—	—	1.16	—	1.16
Aluminium (manufacturing)	1	—	—	0.68	—	0.68
Manufactures of iron and steel (other than machine tools)	5	—	—	2.75	—	2.75
Ice works and refrigeration	6	—	—	13.98	—	13.98
Glass works	1	—	—	8.75	—	8.75
Rubber works	9	—	—	6.29	—	6.29
Rubber footwear	1	—	—	0.38	—	0.38
Batteries and carbon	1	—	—	1.42	—	1.42
Brickworks	3	—	—	1.29	—	1.29
Tobacco	1	—	—	1.18	—	1.18
Film	3	—	—	1.23	—	1.23
Industrial gases	2	—	—	1.70	—	1.70
Asbestos pipes and sheets	1	—	—	3.59	—	3.59
Miscellaneous	7	—	—	0.80	—	0.80
Other large consumers[d]	126	—	—	164.80	—	164.80
TOTAL	202	—	—	228.79	—	228.79
(1962)						
Granite quarrying	1	—	—	0.28	—	0.28
Food manufacturing industries	1	—	—	0.11	—	0.11
Food and drink manufacturing and distributing industries	4	—	—	1.45	—	1.45
Breweries	2	—	—	5.63	—	5.63
Sawmills	4	—	—	0.30	—	0.30
Printing and publishing industries	3	—	—	2.24	—	2.24
Edible oil mills	2	—	—	0.17	—	0.17
Metal industries	2	—	—	0.41	—	0.41
Other Large Customers						
Harbour Board	1	—	—	21.13	—	21.13
Communication department	1	—	—	1.19	—	1.19
Ice works and refrigeration	4	—	—	13.17	—	13.17
Glass works	1	—	—	9.11	—	9.11
Rubber works	1	—	—	1.38	—	1.38
Batteries and carbon	1	—	—	1.46	—	1.46

Table 12 *(Cont'd)*

Industry (1)	No. of factories (2)	Capacity of industry-owned plant (thousand kW) (3)	Electric energy (million kWh): Generated in industry-owned plant (4)	Purchased from public supply power station (5)	Sold to outside agencies (6)	Consumed by the industry (7) =(4)+(5)−(6)
Singapore (1962)—*(Contd.)*						
Brickworks	2	—	—	1.49	—	1.49
Tobacco	1	—	—	1.56	—	1.56
Film	2	—	—	0.50	—	0.50
Industrial gases	2	—	—	1.64	—	1.64
Hospital	2	—	—	3.53	—	3.53
C.B.E. Malaya	1	—	—	59.36	—	59.36
H.M. Forces	8	—	—	69.58	—	69.58
Airport	1	—	—	4.62	—	4.62
Universities and polytechnic	3	—	—	5.21	—	5.21
Singapore City Council gas works	1	—	—	2.15	—	2.15
Singapore City Council sewerage department	1	—	—	1.54	—	1.54
TOTAL	52	—	—	209.31	—	209.31
Nepal (1961)						
Sugar	1	0.05	...	...	...	...
Cotton	1	0.30	...	...	...	...
Jute	2	3.00	...	...	...	...
TOTAL	4	3.35	...	...	...	...
(1962)						
Sugar	1	0.05	...	...	...	...
Cotton	1	0.30	...	...	...	...
Jute	2	3.00	...	...	...	...
TOTAL	4	3.35	...	...	...	...
Philippines (1961)						
I. *Served by Industry-owned plants*						
Plywood	18	6.5	19.5	See II	—	19.5
Paper mills	3	5.8	24.4	and III	—	24.4
Textiles	2	0.5	1.3	below	—	1.3
Cement	4	24.5	60.0		—	60.0
Sugar	25	63.8	141.7		—	141.7
Chemicals	6	10.4	38.9		—	38.9
Cassava flour	12	1.5	3.2		—	3.2
Mining	119	65.5	195.3		—	195.3
Others	15	25.8	55.7		—	55.7
	204	204.3	540.0			540.0
II. *Served by National Power Corporation*						
Cement	1	—	—	20.9	—	20.9
Mining	Included in I	—	—	66.1	—	66.1
Sugar	Included in I	—	—	2.8	—	2.8
Chemicals	2	—	—	151.4	—	151.4
Others	7	—	—	33.6	—	33.6
SUB-TOTAL	10			274.8		274.8
III. *Served by Manila Electric Company*						
	807	—	—	627.1	—	627.1
GRAND TOTAL	1,021	204.3	540.0	901.9		1,441.9

Table 12 *(Cont'd)*

Industry (1)	No. of factories (2)	Capacity of industry-owned plant (thousand kW) (3)	Electric energy (million kWh): Generated in industry-owned plant (4)	Purchased from public supply power station (5)	Sold to outside agencies (6)	Consumed by the industry (7) =(4)+(5)−(6)
			Philippines (1962)			
I. *Served by Industry-owned plants*						
Mining	110	68.9	250.5	See II	—	250.5
Sugar	26	63.2	167.9	and III	—	167.9
Plywood	18	12.3	41.8	below	—	41.8
Chemicals	6	10.3	48.2		—	48.2
Cassava flour	13	1.2	3.6		—	3.6
Cement	6	24.5	61.5		—	61.5
Textiles	3	0.5	1.0		—	1.0
Paper mills	3	4.6	25.8		—	25.8
Others	15	22.8	70.1		—	70.1
SUB-TOTAL	200	208.3	670.4			670.4
II. *Served by National Power Corporation*						
Cement	2	—	—	20.9	—	20.9
Mining	Included in I	—	—	69.5	—	69.5
Sugar	Included in I	—	—	4.4	—	4.4
Chemicals	2	—	—	181.0	—	181.0
Manufacture of iron and steel	3	—	—	26.8	—	26.8
Flour	1	—	—	1.3	—	1.3
Others	5	—	—	9.6	—	9.6
SUB-TOTAL	13			313.5		313.5
III. *Served by Manila Electric Company*						
	929	—	—	743.7	—	743.7
GRAND TOTAL	1,142	208.3	670.4	1057.2		1,727.6
			Thailand[c] (1961)			
Cement	4	14.7	59.8	—	10.9	48.9
State Railways	2	1.8	3.0	—	0.5	2.5
Port Authority	1	1.7	2.4	—	0.7	1.7
Paper mills	1	1.5	6.8	—	0.4	6.4
TOTAL	8	19.7	72.0	—	12.5	59.5
			(1962)			
Cement (Bangkok and Saraburi)	2	11.8	65.5	—	11.8	53.7
Cement (Nakorn Sawan)	1	2.7	...	—	[f]	...
State Railways	2	1.8	2.1	1.1	0.3	2.9
Port Authority	1	1.7	1.6	—	—	1.6
Paper mills	1	2.2	5.7	—	0.4	5.3
TOTAL	7	20.2	74.9	1.1	12.5	63.5

[a] No data available for Afghanistan, Australia, Burma, Hong Kong, Laos, North Borneo (Sabah) and Sarawak, Mongolia, New Zealand, Pakistan and Republic of Viet-Nam.

The industries in Western Samoa are negligible.

No 1961 data available for Brunei.

No 1962 data available for Cambodia, Indonesia and the former Federation of Malaya.

[b] Data incomplete.

[c] Covering industrial consumers with power demand over 500 kW.

[d] Including traction, Harbour Board, Telephone Board, City Council, H.M. Forces, hospitals, prisons, banks, large and government offices, colleges, universities, airport, canning factories, engineering workshops, woodwork industries, oil refineries and metal box manufacture.

[e] No data available for the mining industry, figures of industries as listed being also incomplete.

Table 13: ELECTRICAL ACCIDENTS TO HUMAN BEINGS, 1961 AND 1962[a]

Country and year (1)		Location of accident (2)	Number of accidents involving human beings: Total (3)	Fatal (4)	Non-fatal (5)
Brunei	1962	Distribution lines	1	—	1
Burma[b]	1961	Generating stations and sub-stations; Transmission lines; Distribution lines; Consumers' installations	60	39	21
	1962	Generating stations and sub-stations; Transmission lines; Distribution lines; Consumers' installations	41	26	15
Ceylon	1961	Distribution lines	5	5	—
	1962	Transmission lines	1	1	—
		Distribution lines	10	10	—
		Consumers' installations	5	5	—
China (Taiwan)	1961	Generating stations and sub-stations	3	—	3
		Transmission lines	7	—	7
		Distribution lines	80	31	49
		Consumers' installations	16	12	4
	1962	Generating stations and sub-stations	3	0	3
		Transmission lines	6	1	5
		Distribution lines	102	26	76
		Consumers' installations	17	10	7
Hong Kong[c]	1961	Generating stations and sub-stations	1	—	1
	1962	Generating stations and sub-stations	5	—	5
		Distribution lines	5	—	5
India[d]	1961	Generating stations and sub-stations	63	16	47
		Transmission lines	133	62	71
		Distribution lines	376	140	236
		Consumers' installations	...	...	...
Japan[d]	1961	Generating stations and sub-stations	92	26	66
		Transmission lines	79	18	61
		Distribution lines	681	252	429
		Consumers' installations	302	216	86
	1962	Generating stations and sub-stations	131	42	89
		Transmission lines	70	23	47
		Distribution lines	555	212	343
		Consumers' installations	169	111	58
Korea, Republic of	1961	Generating stations and sub-stations	10	2	8
		Transmission lines	7	2	5
		Distribution lines	32	18	14
		Consumers' installations	43	28	15
	1962	Generating stations and sub-stations	14	5	9
		Transmission lines	18	7	11
		Distribution lines	71	41	30
		Consumers' installations	14	10	4
Malaysia:					
Former Federation of Malaya[e]	1961	Generating stations and sub-stations	1	—	1
		Transmission lines; Distribution lines; Consumers' installations	73	14	59
Sarawak	1961	Distribution lines	3	—	3
	1962	Distribution lines	1	—	1
		Consumers' installations	2	1	1
Singapore	1961	Consumers' installations	8	5	3
	1962	Distribution lines	1	—	1
		Consumers' installations	2	1	1

Table 13 *(Cont'd)*

Country and year (1)		Location of accident (2)	Number of accidents involving human beings: Total (3)	Fatal (4)	Non-fatal (5)
Nepal	1961	Generating stations and sub-stations	1	—	1
		Transmission lines	4	2	2
	1962	Transmission lines	1	—	1
		Distribution lines	4	—	4
New Zealand[d]	1961	Generating stations and sub-stations	2	—	2
		Transmission lines	1	—	1
		Distribution lines	54	8	46
		Consumers' installations	85	11	74
	1962	Generating stations and sub-stations	3	—	3
		Transmission lines	3	1	2
		Distribution lines	53	7	46
		Consumers' installations	72	11	61
Pakistan	1961	Generating stations and sub-stations; Transmission lines; Distribution lines; Consumers' installations	177	90	87
	1962	Generating stations and sub-stations; Transmission lines; Distribution lines; Consumers' installations	158	74	84
Thailand[f]	1961	Distribution lines	12	9	3
		Consumers' installations	14	11	3
Viet-Nam, Republic of	1961	Generating stations and sub-stations; Transmission lines; Distribution lines; Consumers' installations	7	1	6
	1962	Generating stations and sub-stations	2	0	2
		Distribution lines	8	1	7
Western Samoa	1962	Generating stations and sub-stations	1	—	1
		Transmission lines	1	—	1
		Distribution lines	2	—	2
		Consumers' installations	4	2	2

[a] No data available for Afghanistan, Australia, Cambodia, Indonesia, Iran, Mongolia, North Borneo and the Philippines.

No accidents reported in Brunei (for 1961) and in Laos.

No 1961 data available for Western Samoa.

No 1962 data available for India, the former Federation of Malaya and Thailand.

[b] Relating to fiscal year ended 30 September of the specified year.

[c] Relating to Hong Kong Electric Co. Ltd. only.

[d] Relating to fiscal year ended 31 March of subsequent year.

[e] Relating to Central Electricity Board and Kinta Electrical Distribution Co. Ltd.

Table 14: WATER POWER POTENTIAL AND DEVELOPMENT, 1962

Country (1)	Capacity (thousand kW) Estimated potential (2)	Aggregate installed capacity at the end of 1961 (3)	Ratio of installed capacity to estimated potential (percentage) (4)	Basis or method of estimation (5)
Total for 15 countries of ECAFE region[a]	132,066.8	17,562.7	13.3	
Afghanistan[b]	2,500.0	47.9	1.9	Average flow.
Burma	2,000.0	90.9[c]	4.5	Economic potential at about 60% load factor.
Cambodia	5,400.0	—	—	Q 95.
Ceylon	1,400.0	55.5	4.0	Average flow.
China (Taiwan)	5,145.5	538.0	10.5	(a) 30% of flow duration or 0.6 to 0.7 L.F. for run-of-river plants. (b) about 0.3 to 0.4 L.F. for plants with reservoirs.
India[d]	41,000.0	2,730.0	6.7	At 60% load factor.
Indonesia	2,860.0	170.9	6.0	
Japan[d]	36,734.0	14,202.0	38.7	
Korea, Republic of	1,682.3	143.5	8.5	Based on Q average flow and head available.
Malaysia:				
Former Federation of Malaya	790.8	172.6[e]	21.8	754,400 kW estimated potential relating to CEB area, the other 36,400 kW relating only to Chenderoh hydro power station, the former being based on economic potential at 60% load factor, the latter on the theoretical potential taking the average flow for 30 years.
Sarawak	192×10^9kWh	—	—	Theoretical potential assuming runoff — rainfall—70″.
Nepal	20,000.0	3.4	0.02	Rough estimate at 60% load factor; systematic assessment is being undertaken.
Pakistan	10,400.0	333.4	3.20	
Philippines	2,271.0	291.1	12.8	Based on Q average flow and head available.
Thailand	3,292.9	—	—	Arithmetical mean flow.
Viet-Nam, Republic of	1,550.0	3.96	0.25	
Western Samoa	6.4	1.3	20.3	At 60% load factor.

[a] No data available for Australia and Mongolia.

No estimate has been made for Brunei, Hong Kong, Iran, Laos, North Borneo (Sabah) and New Zealand.

No water power potential in Singapore.

[b] Relating to fiscal year ended 20 March 1963 and including self supplying industrial plants.

[c] Including 6,400 kW in five privately owned plants.

[d] Relating to fiscal year ended 31 March 1963.

[e] Including also private installations in the Central Electricity Board area.

Table 15. Power Development Schemes under Construction or Consideration[a]

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
AFGHANISTAN												
Naghlu, hydro-electric	3	22,000	66,000	...	70	...	...	...	...	...	...	Under construction
Jalalabad, hydro-electric	...	...	11,000	...	...	...	...	...	...	...	...	Under construction
Mahiper, hydro-electric	...	...	40,000	...	...	...	...	...	...	...	...	Under construction
Arghandab, hydro-eletric	...	...	15,000	...	...	...	...	...	...	...	...	Under construction
Sheberghan, diesel	...	...	24,000	...	...	...	...	...	...	...	...	Under construction
Kajakai, hydro-electric	...	...	100,000	...	...	...	...	...	...	...	...	Under construction
BURMA												
Transmission system												
Rangoon — Mokpalin				66	32.18	2	...	...	...	...	...	
Toungoo — Penwegon				132	96.56	1	...	...	...	...	...	
Toungoo — Prome				132	160.93	1	...	...	...	...	...	
Kalaw — Taunggyi				66	50.86	2	...	...	...	...	...	
CEYLON												
Laksapana scheme:												
Stage II B. thermal project 2nd unit	1	25,000	25,000	...	...	...	...	4,500	4,500	...	1963	Main sub-stations excluding transformers installed at generating stations.
Stage II B. hydro-electric project at Norton Bridge	2	25,000	50,000	132 33 11	229.3 325.0 18.9	3	40,000	28,260	18,100	10,160	1964	Main sub-stations excluding transformers installed at generating stations.
Chunnakam Central Power Station, diesel	2	2,000	4,000	...	...	...	...	540	540	...	1963	
Maskeliya hydro-electric, stage A Polpitiya	2	30,000	60,000	132 33/11	260 375	5	75,000	40.6	23.5	17.1	Jan. 1966 1968	Power station. Transmission and sub-transmission lines.
CHINA (TAIWAN)												
Nanpu thermal No.3 unit	1	125,000	125,000	...	...	...	...	22,487	22,487	...	Sept. 1963	Under construction.
Kukuan hydro-electric No.3 and No.4 units	2	45,000	90,000	...	...	...	...	4,390	4,390	...	June 1965	Under construction.
Tienlun hydro-electric No.4 unit	1	26,500	26,500	...	...	...	...	1,724	1,724	...	"	Under construction.
Shenao thermal No.3 unit	1	200,000	200,000	...	...	...	...	32,214	32,214	...	Apr. 1966	Under construction.
Gas or oil-fired station	1	250,000	250,000	...	...	...	...	34,600	34,600	...	Dec. 1967	To be constructed.
Tachien reservoir hydro-electric project	8	85,000	680,000	...	...	...	...	181,365	181,365	...	June 1970	Under construction.
Nuclear power plant No.1 unit	1	300,000	300,000	...	...	...	...	66,536	66,536	...	June 1971	To be constructed.
Gas or oil-fired station	1	300,000	300,000	...	...	...	...	37,400	37,400	...	Dec. 1972	To be constructed.
Gas or oil-fired station	1	300,000	300,000	...	...	...	...	37,400	37,400	...	Dec. 1973	To be constructed.
Nuclear plant No.2 unit	1	300,000	300,000	...	...	...	...	64,655	64,655	...	Dec. 1975	To be constructed.
Sun Moon Lake hydro-electric	4	50,000	200,000	...	...	...	...	22,392	22,392	...	June 1976	To be constructed.
Transmission and distribution project				154	942	9 10	1,390,000 1,175,500	242,460		242,460	Dec. 1965 to Dec. 1975	Ten sub-stations (1175 MW) being extension of existing sub-stations.

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
HONG KONG												
Steam plant extension, North Point, Hong Kong island	2	30,000	60,000	6.6 11/6.6	11 40	3(major) and 40 on consumers' premises	26,000	7,084.1	4,497.1	2,587.0	Generating unit in 1963; transmission in 1962/63	
Kowloon steam plant extension	3	60,000	180,000	...	...	...	...	...	...	...	...	
INDIA												
Andhra Pradesh												
Ramagundam thermal power station extension	1	62,500	62,500	...	...	1	50,000 (132/66kV)	11,850	10,190	1,660	1966-67	Transmission system cost covering extensions to the existing sub-stations at Yerragada.
Upper Sileru 1st stage	2	60,000	120,000	—	Included in States' transmission scheme.	...	...	12,800	12,800	...	1966-67	One unit expected to be commissioned by 1965-66.
Kothagudam thermal power station	2	60,000	120,000	132	467.0	1	20,000 (132/66kV)	26,100	20,100	6,000	1966-67	One unit expected to be commissioned by 1965-66.
Tungabhadra-Nellore hydro-thermal scheme . . . . (Tungabhadra stage II)	1 (steam) 4 (hydro-electric)	30,000 9,000	30,000 36,000	132	452	3	120,000 (132/66kV)	18,700	6,860 (Nellore thermal) 4,940 (hydro)	6,900	1964-65 1964	Estimated cost of transmission work relating to Andhra Pradesh only. 3 units of stage II and 5th unit at Hampi power house previously included in stage I now transferred to stage II. Tungabhadra stage II being joint project of Andhra and Mysore states.
Srisailam hydro-electric scheme . . .	4	110,000	440,000	220 132	235.0 312.0	2	40,000 (132 kV)	87,020	68,100	18,920	4th plan	
Package gas turbine sets	2	10,000	20,000					3,470	...	...	1963-64	
Assam												
Naharkatiya thermal power station	3	23,000	69,000	66	538	6	25,000 (66/33/11kV)	29,500	21,000	8,500	1965-66	Revised project report under examination.
				33	188	7	22,500 (33/11/ kV)					
Umiam hydro-electric scheme stage I	4	9,000	36,000	132	180	4	40,000 (132/33/11kV)	16,150	13,490	2,660	1965-66	
Tura (Garo Hills) thermal power station	2	2,500	5,000	...	...	...	...	2,050	1,356	694	1965-66	Only 33 kV lines have been proposed, total km = 243.
Umiam hydro-electric scheme stage II	2 1	9,000 2,800	20,800	132	698	5	65,000 (132/33/11kV)	13,480	5,610	7,870	1966-67	Scheme report under examination.

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Unit capacity (kW) (3)	Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Route length (km) (6)	Main sub-stations: Number of stations (7)	Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Generating station[b] (10)	Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
					INDIA (Ctd.)							
Kopili hydro-electric scheme												
Stage I	5	36,000	570,000	132	810	. . .	. . .	122,510	67,800	7,490	5th plan	
Stage II	6	65,000		132	1,032				36,600	10,620		
Nangwal Bibra thermal station . . .	2	30,000	60,000	132	96	. . .	. . .	16,380	15,250	1,130	1966-67	Benefits during 1965/66, 30,000 kW.. It has since been tentatively decided to locate this power station at Gauhati with 2 × 12.5 MW units in 3rd plan and 1 × 30 MW unit later.
Installation of diesel sets at Tezpur, Jorhat and Chabhua	9 2	1,000 500	10,000	—	—	—	—	1,930	1,930	—	1963-64	
Bihar												
Pathratu steam station stage I . . .	2	50,000	100,000	132	161	2	27,500 (132/33kV)	29,300	29,300	. . .	1964-65	The 132 kV transmission works covering Pathratu-Hatia line for supply to heavy engineering plant and Pathratu-Ramgarh line for interconnexion with DVC costing US$ 2.4 million are included in the Bihar Transmission and Distribution Project Report.
Pathratu steam station stage II . . .	4	2× 50,000 2×100,000	300,000	—	—	—	—	. . .	. . .	—	1966-67	Project report awaited. 220 kV transmission lines for interconnexion with DVC at Jamshedpur and with Barauni are contemplated. 100 MW to be commissioned by 1965-66 and 200 MW by 1966-67.
Barauni thermal station	2	15,000	30,000	. . .	. . .	. . .	. . .	6,495	6,180	315	1963-64	Cost of transmission system being that of 33 kV cable interconnexion with South Bihar system.
Barauni thermal station extension . .	3	1×15,000 2×50,000	115,000	132	451	4	75,000 (132/33kV)	21,800	21,800	. . .	1965-66	The 132 kV transmission works covering the line from Barauni to Muzaffarpur and Barauni to Katihar for utilizing Barauni power in North Bihar are included in the North Bihar transmission scheme (cost US$ 7.24 million).
Gandak hydro-electric project	3	5,000	15,000	132	161	2	. . .	8,490	4,260	4,230	1967-68	
Kosi hydro-electric project	4	5,000	20,000	132	129	. . .	. . .	5,910	4,630	1,280	1966-67	ed by 1965-66. 10 MW expected to be commission-

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system — Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission and sub-transmission lines: Route length (km) (6)	Main sub-stations: Number of stations (7)	Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost: Generating station[b] (10)	Estimated cost: Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
							INDIA (Ctd.)					
Damodar Valley Corporation												
Chandrapura thermal station	2	125,000/ 140,000	250,000/ 280,000	132	65	2	200,000 (132/33kV)	62,970	60,700	2,270	1965-66	
Chandrapura thermal station extension	2	125,000/ 140,000	250,000/ 280,000	132	81	3	350.000 (132/33kV) (new) 200,000 (132/33kV) (extensions)	48,300	48,300	...	1966-67	Transmission works costing US$9.73 million covered under separate transmission and distribution schemes.
Gujarat												
Ahmedabad thermal power station extension	1	30,000	30,000	—	—	—	—	5,320	5,320	—	1963-64	In private sector.
Shahpur thermal power station extension	2	5,000	10,000	—	—	—	—	2,100	2,100	—	1963-64	
Punasa multi-purpose project (Gujarat's share)	9	64,000	576,000 (Gujarat's share is 288,000)	...	...	...	...	106,000	...	...	1970-71	A joint project of Madhya Pradesh and Gujarat, costs and benefits being shared in the ratio of 50:50.
Dhuvaran thermal power station	4	62,500	250,000	132	688	2	315,000 (132/66kV) 12,500 (132/66/11kV)	52,530	44,500	8,030	1964-65	Including cost of Dhasa extension: US$1.24 million.
Kandla thermal power station extension	2	5,000	10,000	—	—	—	—	2,330	2,330	—	1965-66	Only 33 kV lines proposed. Total km = 280.
Jammu and Kashmir												
Ganderbal hydro-electric station	2	4,500	9,000	33	280	...	...	1,530	776	754	1961-62	Cost of transmission system including US$405,000 cost of 11 kV lines and 33 kV lines. Total = 32 km.
Mohora power station	2	4,500	9,000	66	81	...	...	4,170	2,600	1,570	1962-63	Transmission cost including US$615,000 cost of distribution lines. The 66 kV line being interconnecting line from Mohora to Ganderbal.
Chenani hydro-electric scheme	3	5,000	15,000	66	129	2	11,000 (66/ 11kV)	5,895	4,760	1,135	1966-67	10 MW to be commissioned during 1965-66.
Jhelum hydro-electric scheme	7	16,700	116,900	132	196	4	231,000 (132/33/11kV)	37,760	32,400	5,360	4th plan	

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
INDIA (Ctd.)												
Kalakote thermal power station . . .	3	7,500	22,500	132	193	1	30,000 (132/66/11kV) 10,000 (66/11 kV)	8,360	5,380	2,980	1965-66	
Nichahom thermal power station . .	2	7,500	15,000	66	99	1	3,000 (66/33 kV) 3,000 (66/11 kV)	7,630	4,520	3,110	1965-66	
Kerala												
Neriamangalam hydro-electric scheme	3	15,000	45,000	110	492	...	...	7,560	7,560	...	1963-64	
Sholayar hydro-electric scheme . . .	3	18,000	54,000	110	20	...	...	9,060	9,060	...	1964-65	
Panniar hydro-electric scheme	2	15,000	30,000	No transmission				7,770	7,770	...	1963-64	Cost likely to increase to US$10.94 million due to increased cost of eqiupment, cement and labour.
Pamba-Kakki hydro-electric scheme	6	50,000	300,000	220	290	1 1	100,000 (220/110kV) 225,00 (220/110/11kV)	52,410	47,200	5,210	1965-66	
Kuttiadi hydro-electric scheme	3	25,000	75,000	110	77	...	...	11,048	10,480	568	1966-67	
Iddiki hydro-electric scheme	5	100,000	500,000	220 110	320.0 26.0	...	...	103,420	99,000	4,420	4th plan	
Madhya Pradesh												
Amarkantak thermal station	2	30,000	60,000	132 66	682 92	1 4 1	50,000 (132/66/11kV) 90,000 (132/33 kV) 5,000 (66/11 kV)	22,340	12,780	9,560	1964-65	
Chandni thermal station extension . . (located at Korba)	1	10,000	10,000	—	—	—	—	2,100	2,100	—	1963-64	Since commissioned at Korba.
Chambal hydro-electric stage I Gandhisagar power station (4 units)	4	23,000	92,000	*Madhya Pradesh* 132 66	 1,046 240	2 2 1 2	53,000 (132/11 kV) 27,000 (132/33/11kV) 18,000 (132/66/33kV) 28,000 (132/66/11kV) =126,000	47,430	24,380	*M.P. only* 23,050	1963-64	Joint scheme of Madhya Pradesh and Rajasthan States, the sharing of costs and benefits being on the basis of 50:50.
				Rajasthan 132	 750	1 3 4	18,000 (132/66/33kV) 35,000 (132/33/11kV) 53,000 (132/11 kV)			*Rajasthan only* 10,900		Generating station cost including 50% cost of dam allocated to power.

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Unit capacity (kW) (3)	Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Route length (km) (6)	Main sub-stations: Number of stations (7)	Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Generating station[b] (10)	Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
					INDIA (Ctd.)							
Chambal hydro-electric stage I Gandhisagar power station (5th units)	1	23,000	23,000	—	—	—	—	810	810	—	1965-66	
Satpura thermal station	5	62,500	312,500	—	Included in the state transmission scheme.			57,400	57,400	—	1966-67	Two of the five thermal sets are on Rajasthan account. Three units expected to be commissioned by 1965-66.
Korba thermal station extension . . .	4	50,000	200,000		— do —			43,600	43,600	—	1965-66	
Tawa hydro-electric scheme	3 2	10,000 6,000	30,000 12,000	132	113	1	30,000 (132/33 kV)	15,275	14,250	1,025	4th plan	Multi-purpose project. Total cost (US$57.8 million).
Madras												
Kundah hydro-electric project I and II stage	2	20,000	40,000	230	482	2	24,000 (110/66 kV)	74,500	57,500	17,000	1961-62	Revised total cost on the basis of actual expenditure US$66.3 million. All the units have been commissioned.
	4	35,000	140,000	110	98							
Periyar hydro-electric project I and II stage	4	35,000	140,000	110	386	1	6,000 (110/22 kV)	24,000	15,470	8,530	1964-65	Three units commissioned in second plan.
				66	295	3 1 4 1	60,000 (110/66 kV) 9,000 (110/33/11kV) 24,000 (66/33/11kV) 4,500 (33/11 kV)					
Mettur Tunnel hydro-electric scheme	4	50,000	200,000	230 110	244.0 120.0	. . .	. . .	28,040	18,700	9,340	1956-66	
				110	166	. . .	. . .	19,530	17,000	2,530	1965-66	
Kundah hydro-electric project stage III	6	2×60,000 1×50,000 1×20,000 1×20,000 1×35,000	245,000	230	40							
Annamalai (Parambikulam) hydro-electric scheme	6	2×35,000 2×20,000 1×30,000 1×40,000	180,000	110	282	1 1	50,000 (110/66kV) 15,000 (110/33kV)	19,530 (for power only)	17,000	2,530	1967-68	100 MW expected to be commissioned by 1965-66.
Maharashtra												
Koyna hydro-electric scheme stage I	4	60,000	240,000	220	470	1	375,000 (220/110/11kV)	80,500	69,510	10,990	1963-64	All the four units have been commissioned.

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
INDIA (Ctd.)												
Khaperkheda thermal station extension	2	2×30,000	60,000	132 66	560.0 222.0	2	57,500 (132/66kV)	26,350	12,190	14,160	1964-65	
						2	10,000 (132/33kV)					
						8	27,000 (66/33kV)					
						16	73,500 (66/11kV)					
Purna hydro-electric scheme	3	7,500	22,500	—	—	—		3,710	—	—	1965-66	
Bhusawal thermal station	1	62,500	62,500	132	835	4	16,000 (132/11kV)	41,700	21,000	20,700	1965-66	
				66	282	2	17,500 (132/33/11kV)					
Paras thermal station extension . . .	1	62,500	62,500			4	40,000 (132/66kV)				1964-65	
						4	30,000 (132/33kV)					
						2	8,000 (66/33kV)					
						2	8,000 (66/33/11kV)					
						11	42,000 (66/11kV)					
Vaitarna hydro-electric scheme . . .	2	30,000	60,000	132	14.48	—	—	23,100	—	—	4th plan	
Koyna hydro-electric project stage II (Underground P.H. extension)	4	75,000	300,000	220	252	1	250,000 (220/110/11kV)	26,170	17,050	9,120	4th plan	225 MW in third plan.
Dam power house	2	20,000	40,000	—	—	1	20,000 (230/34.5/11kV)	4,570	—	—	. . .	Total cost including cost of dam.
Sahasrakund hydro-electric scheme	1	50,000	50,000	—	—	—	—	20,650	20,650	—	4th plan	Project report is awaited.
Mysore												
Sharavathi hydro-electric scheme stage I	2	89,100	178,000	220	388	1	200,000 (220/110/11kV)	88,900	76,900	12,000	1964-65	Total cost under revision to US$103.7 million (Gen.) and US$13.51 million (transmission and receiving stations).
						1	135,000 (220/66/11kV)					
Bhadra hydro-electric scheme	4	2×12,000 1× 7,200 1× 2,000	33,200	66	58	—	—	7,990	7,560	430	1963-64	Power fed into the existing grid at Shimoga receiving station.
Tungabhadra left bank hydro-electric scheme . . . . (Munirabad 1st and 2nd stage)	3	9,000	27,000	110	298	1	8,000 (132/11/33kV)	13,520	6,620	6,900	1964-65	Revised cost US$12.7 million.
						1	4,000 (132/66kV)					
						3	24,000 (66/11/33 kV)					

Table 15 (Cont'd)

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
INDIA (Ctd.)												
Sharavathi hydro-electric scheme stage II	6	89,100	534,600	220	760	2 1	210,000 (220/110/11kV) 135,000 (220/66/11kV)	58,400	46,400	13,250	1966-67	Generation for 5 units approved for US$38 million. Four units expected to be commissioned by 1965-66.
Orissa												
Hiradud stage II												
Power house at Chiplima	3	24,000	72,000	132	671	2 2 3 3	120,000 (132/33kV) 40,000 (132/66kV) 85,000 (132/11kV) 22,000 (66/11kV)	31,400	—	—	1963-64	Completed.
Extension of dam power house at Hirakud dam	2	37,500	75,000	66	259							
Talcher thermal power station . . .	4	62,500	250,000	220 132	146 206	1 1 2 1	100,000 (220/132kV) 15,000 (132/66kV) 70,000 (132/33kV) 10,000/ 25,000 (132/11kV)	63,800	53,400	10,400	1966-67	Three units expected to be commissioned by 1965-66.
Balimela hydro-electric project	5	60,000	300,000 (tentative)	. . .	. . .	. . .	. . .	. . .	. . .	. . .	1969-70	Detailed report being awaited from the State.
Punjab												
Bhakra Nangal project	4 2 5	24,000 29,000 53,000/ 90,000	96,000 58,000 265,000/ 450,000	220 132 66	699 1,088 599	2 2 11 7 2 2	270,000 (220/132kV) 320,000 (220/66kV) 137,000 (132/33/11kV) 40,000 (66/11kV) 14,000 (66/33/11kV) 14,000 (66/33kV)	152,700	110,000	42,700	—	Completed, total revised estimated cost including irrigation, US$369 million.
Upper Bari Doap Canal stage I . . .	3	10,000	30,000	. . .	. . .	. . .	. . .	12,290	12,290	—	4th plan	30,000 kW in 1967-68.
Ultimate	6	10,000	60,000					18,700	18,700	—	4th plan	

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
INDIA (Ctd.)												
Bhakra Right Bank Power station . .	4	70,000/ 120,000	280,000/ 480,000	220	636	1	120,000 (220/132/66kV)	74,200	40,900	33,300	1966-67	One unit expected to be commissioned during the third plan.
				132	328	1	45,000 (220/132kV)					Jointly-owned project of Punjab and Rajasthan.
				66	460	1	100,000 (220/66kV)					
						1	22,000 (132/66kV)					
						3	75,000 (132/11kV					
						1[illegible]	76,000 (132/66/33kV)					
						3	49,000 (132/66/11kV)					
						1	38,000 (132/66/11kV)					
						12	915,000 (66/11kV)					
						5	76,000 (66/33/11kV)					
						2	12,000 (66/33kV)					
Uhl River hydro-electric project stage II	3	15,000	45,000	132	5	—	—	9,924	9,840	84	1966-67	One unit expected to be commissioned during third plan.
Beas project unit I . . . . (Dehar power house)	6 1	106,000 120,000*	756,000	...	...	...	...	211,000	**	**	1970-71	* Fifth unit at Bhakra Right Bank power house costing US$5.25 million to be installed under Beas project unit I, and expected to be installed by 1966-67. Jointly owned project of Punjab and Rajasthan. ** Cost of civil works US$162.4 million. Cost of electrical works: US$40.8 million.
Beas project unit II . . . . (Pong dam power house)	4	60,000	240,000	...	...	...	...	...	...	...	...	Jointly owned project of Punjab and Rajasthan.
Thermal power station at Faridabad	1	15,000	15,000	—	—	—	—	3,570	—	—	1964-65	
Thermal power station at Delhi . . .	3	50,000/ 62,500	150,000/ 187,500	—	—	—	—	33,900	—	—	1966-67	Jointly owned by Delhi Electric Supply Undertaking and Punjab. S.E.B. Punjab's share being one unit and Delhi's two units. Two units expected to be commissioned by 1965-66.

Table 15 (Cont'd)

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission and sub-transmission lines: Route length (km) (6)	Main sub-stations: Number of stations (7)	Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Generating station[b] (10)	Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
					INDIA (Ctd.)							
Rajasthan												
Rana Partap Sagar hydro-electric project (Chambal hydro-electric project stage II)	4	43,000	172,000	132	727	9	192,000 (132/33/11kV)	39,800	39,800	—	1967-68	These are joint projects of M.P. and Rajasthan states. Transmission works for Rajasthan under these schemes are covered under a separate scheme estimated to cost US$19,200 million.
				66	204	4	16,300 (66/33/11kV)					
Kotah dam power project (Chambal hydro-electric project stage III)	3	33,300	99,900	—	—	—	—	20,320	20,320	—	1967-68	
Uttar Pradesh												
Rihand hydro-electric scheme	6	50,000	300,000	132	485.0	3	70,000 (132/33kV)	78,900	69,700	9,200	1965-66	First five units already commissioned by 1962-63. Sixth unit to be commissioned in 1965-66.
South-east area thermal project (Singrauli/obra thermal power station)	5	50,000	250,000	Included in the State's transmission and distribution scheme.				...	—	—	1966-67	150 MW benefits in the third plan. The project report is awaited.
Harduaganj power station I and II	2	30,000	60,000	Included in the State's transmission and distribution scheme.				11,800	11,800	—	1962-63	Completed.
	1	30,000	30,000	—	—	—	—	5,240	5,240	—	1964-65	
Kanpur thermal station extension	1	15,000	15,000			—	—	4,300	4,300	—	1962	Unit commissioned in 1962-63.
60 MW thermal station at Kanpur	2	30,000	60,000	Included in the State's transmission and distribution scheme.				14,350	14,350	—	1965-66	
Yamuna hydro-electric project stage I	3	11,250	33,750	...	...	...		35,400	35,400	...	1967-68	56 MW in 1966-67.
	3	17,000	51,000	...	...	...						28 MW in 1967-68.
Yamuna hydro-electric project stage II	4	86,000	344,000	—	—	—		105,800	105,800	—	1970-71	
Matatila project	3	10,000	30,000	132	217	1	25,000 (132/66kV)	16,520	8,750	4,780*	1966-67	30 MW in 1956-66. * Estimated cost of main transmission works (covering 66 kV and 132 kV transmission lines).
				66	209	2	32,500 (132/33kV)			2,990**		** Covers estimated cost of sub-transmission works.
Obra hydro-electric project	3	33,300	99,900	132	64	...	...	22,300	22,300	—	1967-68	
Ram Ganga hydel scheme	3	45,000	135,000	—	—	—	—	22,940	21,680	1,260	5th plan	
West Bengal												
Jaldhaka project stage I	3	9,000	27,000	66	262	8	20,000 (66/11kV)	10,990	6,830	4,160	1964-65	Cost likely to be revised to US$14.6 million.
Jaldhaka project stage II	2	4,500	9,000	*	—	5	7,000 (66/11kV)					
						1	4,000 (66/33kV)	3,851	3,330	521	1966-67	* Only 33 kV and 11 kV lines are proposed.

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
						INDIA (Ctd.)						
Bandel thermal station	4	75,000/ 89,000	300,000/ 356,000	—	—	—	—	62,815	62,500	315	1964-65	* For connecting the power house with state grid.
Durgapur Coke oven power house extension	3	75,000	225,000	132	332	...	...	37,920	33,400	4,520	1965-66	* Cost likely to increase to US$43.7 million.
Union Territories												
Delhi 36 MW 'C' station	1	36,000	36,000	—	No transmission works			8,500	8,500	—	1963-64	Already commissioned.
15 MW set at Delhi	1	15,000	15,000	—	— do —			3,740	3,740	—	1964-65	
						INDONESIA						
Makassar steam	2	12,500	25,000	70/30	...	...	...	...	...	...	1965	
Palembang "	2	12,500	25,000	70/30	...	...	...	...	...	...	1966	
Sumatra Barat "	2	12,500	25,000	...	...	...	...	...	...	...	1966	
Medan "	2	12,500	25,000	...	...	...	...	...	...	...	1965	
Bitung "	2	5,000	10,000	...	...	...	...	...	...	...	1967	
Probolinggo "	2	5,000	10,000	...	...	...	...	...	...	...	1967	
Ambon "	1	5,000	5,000	...	...	...	...	...	...	...	1968	
Samarinda "	2	5,000	10,000	...	...	...	...	...	...	...	1968	
Perak/Surabaja "	2	25,000	100,000	70/30	...	...	...	...	...	...	1963	
	1	50,000		...	...	...	...	...	...			
Priok/Djakarta "	2	25,000	100,000	70	—	...	...	...	...	...	1963	
	1	50,000										
Semarang	2	25,000	100,000	...	...	...	...	...	...	...	1965	
	1	50,000										
Djatiluhur hydro-electric	6	25,000	150,000	150	...	...	...	...	...	...	1965	
Ngebel hydro-electric, (East Java)	1	2,250	2,250	30	...	...	...	...	...	...	1965	
Riam Kanan hydro-electric, Kalimantan	...	...	30,000	...	...	...	...	...	...	...	1966	
Kali Konto hydro-electric, East Java	1	3,000	3,000	...	...	...	...	...	...	...	1967	
Sigura-gura, hydro-electric, Sumatra	...	...	120,000	...	...	...	...	...	...	...	1967	
Batang Agam, hydro-electric, Sumatra	...	...	10,000	...	...	...	...	...	...	...	1967	
Karangkates, hydro-electric, East Java	...	...	60,000	...	...	...	...	...	...	...	1967	
Garung, hydro-electric Central Java	...	...	10,000	...	...	...	...	...	...	...	1967	
Wlingi, hydro-electric East Java	...	...	30,000	...	...	...	...	...	...	...	1969	
Tjepu gas turbine, East Java	2	10,000	30,000	...	...	...	...	...	...	...	1968	
Diesel electrification of 154 towns (throughout Indonesia)	...	...	109,760	...	...	...	...	...	...	...	1969	Partly completed in 1962.
						IRAN						
Hydro-electric projects												
Mandjill dam	2	17,500	35,000	132	100	2	37,5000	...	...	...	...	Ultimate capacity 87,500 kW; 35 MW power plants complete, transmission lines under construction.

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission and sub-transmission lines: Route length (km) (6)	Main sub-stations: Number of stations (7)	Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost: Generating station[b] (10)	Estimated cost: Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
						JAPAN						
(1) *Power stations*												
i. New construction												
(a) *Hydro power stations*												
Takane No.1, Gifu	...	...	340,000						55,555		Mar. 1969	
Takane No.2, Gifu	...	...	25,600						12,499		Sept. 1968	
Kiso, Nagano	...	...	116,000						36,111		Dec. 1967	
Shin-Kosaka, Gifu	...	...	30,000						11,389		Mar. 1966	
Tahara, Okayama	...	...	23,500						6,747		Aug. 1967	
Kuroshima, Okayama	...	...	2,200						1,719		Aug. 1967	
Ohtaguchi, Kochi	...	...	1,500						705		May 1965	
Shuku, Oita	...	...	4,500						1,912		July 1965	
Shijushida, Iwate	...	...	15,100						4,917		June 1967	
Shibahira, Akita	...	...	2,700						875		Mar. 1965	
Ohsawagawa, Yamagata	...	...	4,900						1,599		Feb. 1967	
Taguchi, Gumma	...	...	5,800						4,167		June 1966	
Sagami No.1, Kanagawa	...	...	59,000						11,083		Feb. 1967	
Yomegane, Toyama	...	...	11,400						3,386		Feb. 1966	
Misedani, Mie	...	...	11,200						2,917		Jan. 1966	
Kamo No.1, Okayama	...	...	14,000						5,453		June 1967	
Mizukoshi, Yamaguchi	...	...	1,300						419		Sept. 1965	
Yokogawa No.1, Nagano	...	...	10,000						3,794		July 1965	
Horoka, Hokkaido	...	...	10,000						4,939		Oct. 1965	
Nagano, Fukui	...	...	220,000						70,417		Aug. 1968	
Yugami, Fukui	...	...	54,000						20,528		May 1968	
Ikehara (Additional), Nara	...	...	200,000						10,494		May 1966	
Naie, 1st Stage, Hokkaido	1	175,000	175,000						35,583		Mar. 1967	
Yokosuka, 5th stage, Kanagawa	1	350,000	350,000						38,889		Dec. 1966	
Taketoyo, 1st stage, Aichi	1	220,000	220,000						37,222		Mar. 1967	
Toyama, 2nd stage, Toyama	1	156,000	156,000						18,417		June 1966	
Sakaiko, 2nd stage, Osaka	1	250,000	250,000						27,944		Mar. 1967	
Sakaiko, 3rd stage, Osaka	1	250,000	250,000						24,000		Sept. 1967	
Amagasaki Higashi No.2, 2nd stage, Hyogo	1	156,250	156,000						17,750		Mar. 1967	
Shimonoseki, 1st stage, Yamaguchi	1	156,250	156,000						25,556		Mar. 1967	
Nakoso, 5th stage, Fukushima	1	175,000	175,000						22,458		Mar. 1967	
Wakayama-Kyodo, 2nd stage, Wakayama	1	75,000	75,000						8,889		Dec. 1965	
ii. *Construction continued from the preceding year.*												
Okuniikappu, Hokkaido	...	...	44,000						23,275		Nov. 1963	
Shumbetsu, Hokkaido	...	...	27,000						10,586		Jan. 1964	
Shizunai, Hokkaido	...	...	23,500						12,217		Feb. 1966	
Nanaii, Hokkaido	...	...	10,000						2,686		Mar. 1965	
Kanayama, Hokkaido	...	...	25,000						7,297		Dec. 1966	

Table 15 *(Cont'd)*

(1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
JAPAN (Ctd.)												
Agekawa, Niigata	...	...	53,600						25,277		July 1964	
Shin-Nikkogawa, Yamagata	...	...	14,300						6,583		Mar. 1964	
Igasawa No.1, Niigata	...	...	10,100						4,139		Dec. 1966	
Kawamata, Tochigi	...	...	27,000						8,197		Feb. 1964	
Kuriyama, Tochigi	...	...	28,000						5,144		Feb. 1964	
Shimotaki, Tochigi	...	...	89,500						16,283		Feb. 1964	
Shioya, Tochigi	...	...	9,200						7,047		Feb. 1964	
Yagisawa, Gumma	...	...	240,000						38,250		June 1967	
Ubusaka, Nagano	...	...	21,000						10,739		Oct. 1964	
Azumi, Nagano	...	...	642,000						96,144		Jan. 1972	
Yogoyama, Gifu	...	...	70,000						14,167		June 1964	
Bambajima, Toyama	...	...	21,000						6,292		July 1963	
Shin-Inotani, Gifu	...	...	33,500						10,131		July 1964	
Katagai Higashimats, Toyama	...	...	7,400						3,333		July 1963	
Akarajima, Ishikawa	...	...	4,500						2,778		Aug. 1964	
Joganjigawa No.2, Toyama	...	...	5,000						2,167		Dec. 1964	
Joganjigawa No.3, Toyama	...	...	5,000						2,425		Dec. 1964	
Joganjigawa No.4 Toyama	...	...	5,000						2,347		Dec. 1964	
Ohtakigawa, Nagano	...	...	34,000						9,003		June 1963	
Amagase, Kyoto	...	...	92,000						15,486		Mar. 1964	
Shin-Kurobegawa No.3, Toyama	...	...	56,000						16,367		June 1964	
Wachi, Kyoto	...	...	5,700						2,444		Dec. 1964	
Ogami, Toyama	...	...	14,000						4,256		Sept. 1965	
Shin-Kurobegawa No.2, Toyama	...	...	40,000						14,028		June 1967	
Kurobegawa No.4, Toyama	...	...	258,000						148,633		Dec. 1967	
Fuchu, Hiroshima	...	...	12,300						5,489		Jan. 1964	
Ochiai, Hiroshima	...	...	4,400						1,958		Apr. 1964	
Shin-Naruhagawa, Okayama	...	...	100,000						32,192		Jan. 1968	
Ananaigawa, Kochi	...	...	12,500						18,225		Nov. 1964	
Shin-Hirayama, Kochi	...	...	41,500						7,631		May 1963	
Shinkai No.1, Kochi	...	...	8,700						3,481		May 1963	
Kagedaira, Tokushima	...	...	42,000						15,189		June 1967	
Hitotsuse, Miyazaki	...	...	180,000						56,750		Sept. 1963	
Sen-nin, Iwate	...	...	37,600						10,278		Mar. 1965	
Minase, Akita	...	...	5,300						1,500		Mar. 1965	
Sanooka, Yamagata	...	...	6,700						2,772		Dec. 1965	
Kasahori, Niigata	...	...	7,200						2,528		Aug. 1965	
Kazami, Tochigi	...	...	10,200						5,211		Oct. 1964	
Sonohara No.1, Gumma	...	...	26,000						7,722		Oct. 1964	
Sonohara No.2, Gumma	...	...	5,300						2,778		Oct. 1964	
Yukawa, Gumma	...	...	8,100						1,972		Apr. 1965	
Futatsuse, Saitama	...	...	4,700						1,708		June 1963	
Tamayodo No.2, Saitama	...	...	4,300						1,639		May 1964	

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
JAPAN (Ctd.)												
Shiroyama, Kanagawa	...	...	250,000						42,864		Dec. 1964	
Norogawa, Yamanashi	...	...	20,000						8,889		Sept. 1964	
Shitoku, Nagano	...	...	1,800						992		May 1964	
Yatsuo, Toyama	...	...	7,800						3,375		June 1963	
Tatenowaki, Toyama	...	...	12,700						3,450		Mar. 1966	
Kamiichikawa, Toyama	...	...	5,000						1,642		Nov. 1964	
Shinwagatani, Ishikawa	...	...	6,700						2,667		Jan. 1965	
Dainichigawa, Ishikawa	...	...	11,200						4,325		June 1967	
Kamideratsu, Ishikawa	...	...	16,200						5,361		Mar. 1966	
Takinamigawa No. 1, Fukui	...	...	12,300						4,425		Jan. 1965	
Iwakura, Wakayama	...	...	11,000						4,533		Feb. 1966	
Niimi, Okayama	...	...	10,900						4,500		Feb. 1965	
Sugano, Yamaguichi	...	...	14,500						4,028		Oct. 1965	
Tokuyama, Yamaguchi	...	...	6,500						5,217		Oct. 1965	
Dozendogo No.1, Ehime	...	...	3,500									
Dozendogo No.2, Ehime	...	...	11,000						11,083		Mar. 1964	
Dozendogo No.3, Ehime	...	...	10,600									
Kiya, Fukuoka	...	...	6,000						3,967		May 1963	
Serikawa No3, Ohita	...	...	2,300						964		May 1964	
Tachibana, Miyazaki	...	...	8,400						6,475		Mar. 1964	
Sanzaigawa, Miyazaki	...	...	8,600						3,267		Mar. 1963	
Tsuchitaru, Niigata	...	...	6,800						2,139		Oct. 1964	
Tohnaru, Ehime	...	...	20,000						8,719		Dec. 1965	
Yamane, Ehime	...	...	6,700						2,505		Dec. 1965	
Mibugawa No.2, Nagano	...	...	10,000						3,547		Dec. 1963	
Mibugawa No.3, Nagano	...	...	3,000						1,186		Dec. 1964	
Yokokawa No.2, Nagano	...	...	16,000						3,511		July 1964	
Memaru, Kumamoto	...	...	5,700						1,300		Jan. ;1966	
Ambogawa No.1, Kagoshima	...	...	10,200						3,389		Apr. 1983	
Ambogawa No.2, Kagoshima	...	...	26,500						6,944		Nov. 1964	
Ohtori, Fukushima	...	...	95,000						21,608		June 1964	
Kuromatagawa No.2, Niigata	...	...	17,000						11,042		Nov. 1964	
Miboro No.2, Gifu	...	...	59,200						21,439		June 1964	
Ikehara, Nara	...	...	140,000						73,669		Mar. 1965	
Nanairo, Wakayama	...	...	80,000						23,431		Oct. 1965	
Komori, Mie	...	...	45,000						17,106		Dec. 1965	
Futamata, Hokkaido	...	...	72,100						18,878		June 1963	
Yanase, Kochi	...	...	32,500						32,256		Dec. 1965	
Sendaigawa No.1, Kagoshima	...	...	120,000						37,292		Mar. 1965	
Sendaigawa No.2, Kagoshima	...	...	15,000						9,547		Mar. 1965	

Table 15 *(Cont'd)*

Name and location of the project (1)	*Generating station: Number of generating units (2)*	*Unit capacity (kW) (3)*	*Total plant capacity (kW) (4)*	*Transmission system — Transmission and sub-transmission lines: Voltage (kV) (5)*	*Route length (km) (6)*	*Main sub-stations: Number of stations (7)*	*Aggregate transformer capacity (kVA) (8)*	*Estimated cost (thousand US$): Total (9)*	*Generating station[b] (10)*	*Transmission system[c] (11)*	*Anticipated date of completion (12)*	*Remarks (13)*
JAPAN (Ctd.)												
(b) *Thermal power stations*												
Shin-Ebetsu, 2nd S., Hokkaido . .	1	125,000	125,000						17,583		June 1964	
Shin-Ebetsu, 3rd S., Hokkaido . .	1	125,000	125,000						17,166		Mar. 1965	
Niigata, 1st Stage, Niigata	1	125,000	125,000						27,778		Mar. 1964	
Niigata, 2nd Stage Niigata	1	125,000	125,000						18,333		Sept. 1964	
Niigata, 3rd Stage, Niigata	1	250,000	250,000						34,028		Mar. 1966	
Niigata, 4th Stage, Niigata	1	250,000	250,000						33,194		Sept. 1967	
Yokohama, 2nd Stage, Kanagawa .	3	175,000	525,000						57,069		May 1964	
Goi, 1st Stage, Chiba	1	265,000	265,000						41,667		Sept. 1963	
Goi, 2nd Stage, Chiba	1	265,000	265,000						30,006		Apr. 1964	
Kawasaki, 4th Stage, Kanagawa . .	1	175,000	175,000						23,267		Nov. 1963	
Yokusuka, 3rd Stage, Kanagawa . .	2	350,000	700,000						83,653		Oct. 1964	
Goi, 2nd Stage, Chiba	2	265,000	530,000						52,861		Nov. 1965	
Kawasaki, 5th Stage, Kanagawa . .	1	175,000	175,000						23,611		Jan. 1966	
Yokosuka, 4th Stage, Kanagawa . .	1	350,000	350,000						37,953		Aug. 1966	
Yokkaichi, 1st Stage, Mie	2	220,000	440,000						54,878		Sept. 1964	
Yokkaichi, 2nd Stage, Mie	1	220,000	220,000						24,444		Sept. 1964	
Owase, 1st Stage, Mie	1	375,000	375,000						54,444		Mar. 1965	
Owase, 2nd Stage, Mie	1	375,000	375,000						42,778		Mar. 1965	
Shin-Nagoya, 5th Stage, Aichi . .	2	220,000	440,000						48,056		Sept. 1964	
Chita, 1st Stage, Aichi	1	375,000	375,000						51,389		Sept. 1966	
Chita, 2nd Stage, Aichi	1	375,000	375,000						38,056		Sept. 1967	
Toyama, 1st Stage, Toyama . . .	1	156,250	156,000						23,281		Oct. 1964	
Himeji No.2, 1st Stage, Hyogo . .	1	250,000	250,000						36,250		Sept. 1964	
Himeji No.2, 1st Stage, Hyogo . .	1	325,000	325,000						39,361		Sept. 1964	
Tanagawa, 2nd Stage, Osaka . . .	1	156,000	156,000						24,367		Mar. 1965	
Kasugade, 1st Stage, Osaka	2	156,000	312,000						37,680		Mar. 1964	
Amagasaki No.3, 2nd Stage, Hyogo	1	156,000	156,000						15,791		Mar. 1964	
Tanagawa, 3rd Stage, Osaka . . .	1	156,000	156,000						16,897		Mar. 1964	
Himeji No.2, 2nd Stage, Hyogo . .	1	325,000	325,000						33,333		Sept. 1965	
Sakaiko, 1st Stage, Osaka	2	250,000	500,000						63,750		Mar. 1966	
Ama-Higashi No.2, 1st Stage, Hyogo	1	156,000	156,000						22,972		Mar. 1966	
Mizushima, 2nd Stage, Okayama .	1	156,000	156,000						18,611		Mar. 1964	
Kudamatsu, 1st Stage, Yamaguchi .	1	156,000	156,000						24,722		Mar. 1965	
Iwakuni, 1st Stage, Yamaguchi . .	1	220,000	220,000						31,944		Mar. 1966	
Shin-Tokushima, 1st Stage, Tokushima	1	125,000	125,000						18,183		Aug. 1963	
Shin-Saijo, 1st Stage, Ehime . . .	1	156,000	156,000						24,124		Jan. 1966	
Ohmura, 2nd Stage, Nagasaki . . .	1	156,000	156,000						22,861		Mar. 1965	
Saga, 1st Stage, Saga	1	156,000	156,000						25,833		Mar. 1965	
Shin-Minato, 2nd Stage, Fukuoka .	1	156,000	156,000						21,222		Mar. 1965	
Sakai Kyodo, Hyogo	2	75,000	150,000						20,555		Mar. 1965	
Wakayama Kyodo, Wakayama . .	1	75,000	75,000						11,111		Sept. 1963	
Shin-Karita, Fukuoka	1	220,000	220,000						38,111		May 1964	

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
JAPAN (Ctd.)												
(2) *Transmission Line*												
Tokyo Higashi Line				275	19.5					1,086	Feb. 1963	Including only transmission lines of voltages 220 kV and over
Goi Thermal Power Line				275	11.0					2,639	Mar. 1963	
Tokyo Minami Line No. 2				275	35.0					9,625	Dec. 1963	
Tokyo Nishi Line, No.2				275	25.0					5,247	Dec. 1963	
Tokyo Higashi Line				275	1.0					358	Mar. 1963	
Chita Thermal Power Line				275	16.0					3,850	Jan. 1964	
Owase Trunk Line				275	141.0					11,306	Jan. 1964	
Ohgaki Line (Additional)				275	36.0					675	May 1963	
Nishi Nagoya Line (Additional)				275	28.0					544	May 1964	
Higashi Nagoya Line (Additional)				275	24.0					433	Nov. 1964	
Shin-Toyama Trunk Line				275	28.9					1,675	Apr. 1964	
Dai-Kurobe Trunk Line				275	244.0					13,817	Nov. 1963	
Himeji Thermal Power Nishi Line				275	21.4					2,650	Apr. 1963	
Minami Osaka Line				275	43.0					3,053	Apr. 1963	
Minami Osaka Line (Additional)				275	43.0					569	Apr. 1963	
Kita Osaka Line				275	1.0					158	Oct. 1963	
Shin Kurobe No.3 Branch Line				275	1.0					156	Sept. 1963	
Shin Hokuriku Trunk Line				275	0.5					106	Oct. 1963	
Himeji Thermal Power Higashi Line				275	18.0					1,986	Apr. 1964	
Hitotsuse Trunk Line				220	38.8					1,819	Mar. 1963	
Shin-Karita — Karita Tie Line				220	19.4					1,111	Dec. 1963	
Hototsuse Hitoyoshi Line				220	60.0					2,242	May 1963	
Shin-Kammon Trunk Line (Add.)				220	70.6					972	Dec. 1963	
Kumano System Transmission Line				275	187.4					13,831	Nov. 1964	
Ikehara Owase Line				275	26.0					1,811	Nov. 1964	
Ohtori Branch Line				275	1.4					131	Nov. 1963	
Miboro Tie Line				275	2.0					92	Nov. 1963	
(3) *Substations*												
Nishi-Sapporo, Hokkaido						...	100,000			1,411	Sept. 1963	Including only substations of 100,000 kVA Capacity and over
Boso, Chiba						...	440,000			5,131	May 1964	
Totsuka, Kanagawa						...	105,000			1,633	Sept. 1963	
Kita-Tokyo, Saitama						...	300,000			1,572	Mar. 1964	
Numazu, Kanagawa						...	440,000			5,556	Oct. 1964	
Mishima, Kanagawa						...	105,000			2,361	Oct. 1964	
Kyohoku, Tokyo						...	105,000			536	Oct. 1964	
Saitama, Saitama						...	105,000			513	Oct. 1963	
Nambu, Kanagawa						...	105,000			494	Oct. 1963	
Kawasaki, Kanagawa						...	105,000			589	Aug. 1963	
Asahi, Kanagawa						...	105,000			492	Oct. 1963	
Hashimoto, Kanagawa						...	105,000			492	Oct. 1963	
Ikebukuro, Tokyo						...	150,000			2,486	Oct. 1964	
Daishi, Kanagawa						...	145,000			1,439	Dec. 1963	

Table 15 (Cont'd)

Name and location of the project (1)	Generating station: Number of generating units (2)	Unit capacity (kW) (3)	Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Route length (km) (6)	Main sub-stations: Number of stations (7)	Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Generating station[b] (10)	Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
JAPAN (Ctd.)												
Higashi Nagoya, Aichi						...	330,000			2,069	Nov. 1964	
Nishi Nagoya, Mie						...	330,000			2,222	May 1964	
Hamamatsu, Shizuoka						...	120,000			1,550	Nov. 1963	
Kansei, Aichi						...	120,000			714	Nov. 1964	
Ohgaki, Gifu						...	180,000			2,042	July 1963	
Yokkaichi Thermal, Mie						...	120,000			2,169	Nov. 1963	
Shin Toyama, Toyama						...	400,000			4,994	Apr. 1964	
Kita Osaka, Osaka						...	400,000			6,525	Oct. 1963	
Higashi Osaka, Osaka						...	200,000			1,656	June 1963	
Nagasone, Osaka						...	150,000			678	June 1963	
Toyosaki, Osaka						...	200,000			739	Aug. 1963	
Shin Kobe, Hyogo						...	150,000			1,231	Oct. 1963	
Shin Kakogawa, Hyogo						...	200,000			3,031	Apr. 1964	
Sakaiko, Osaka						...	200,000			2,856	June 1964	
Shin Hachiman, Shiga						...	100,000			814	Sept. 1964	
Kita Osaka, Osaka						...	200,000			1,286	Oct. 1964	
Hiroshima, Hiroshima						...	200,000			1,258	Nov. 1964	
Kagawa, Kagawa						...	120,000			1,267	June 1963	
Shinkai, Kochi						...	120,000			736	Oct. 1964	
Minami Kawagoe, Saitama						...	264,000			2,297	Nov. 1963	
Sakuma Frequency Converting Equip., Shizuoka						...	300,000			19,613	Dec. 1965	
Nagoya, Aichi						...	132,000			1,678	Nov. 1963	
KOREA, REPUBLIC OF												
Cheju-diese,l Cheju	1	1,310	1,310	—	—	—	—	258	258	—	Feb. 1963	
Samchok-thermal, Kangwon No. 2	1	30,000	30,000	22 154	406.8 402.0	25 3	103,350 402,000	8,693	8,623	70	Dec. 1963	
Pusan-thermal, Pusan	2	66,000	132,000	66 22	1,315.6 351.7	50 17	766,500 73,850	30,899	28,886	2,013	Feb. 1964	
Kunsan-thermal No.1, Kunsan	1	66,000	66,000	66	...	...	...	18,815	18,281	534	Oct. 1965	
New Yongwol-thermal, Kangwon	2	50,000	100,000	66	...	...	...	24,671	24,671	...	Sept. 1964	
Tanginri-thermal, Seoul No.4 No.5	1 1	66,000 66,000	66,000 66,000	66	...	...	...	32,917	32,293	624	Dec. 1965	
Sumjinkang-hydro-electric, Junbuk	1	14,000	14,400	...	...	...	...	15,918	15,918	...	Dec. 1964	
Chunchon-hydro-electric, Kangwon	2	28,800	57,600	154 66	...	...	...	20,497	20,415	82	Dec. 1964	
Chongpyong-hydro-electric (rehabilitation), Kyungki	2	19,800	39,600	...	...	...	...	7,838	7,838	...	June 1965	
Yongwol-thermal (rehabilitation), Kangwon	...	...	80,000	...	...	...	...	7,695	7,695	...	Apr. 1963	

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
LAOS												
Diesel station in Vientiane	3	1,000	3,000	6.6	...	...	...	789	789	...	...	Under construction, US$666,000 aid from Japan.
" " " "	1	1,000	1,000	6.6	...	...	...	...	...	...	...	Under consideration.
MALAYSIA												
Former Federation of Malaya												
Cameron Highlands hydro-electric, Jor power station	4	25,000	100,000	132	211	4	310,000	43,700	28,000	15,700	1963	Underground station; cost of civil works included under column (10).
Cameron Highlands hydro-electric, Habu power station	2	2,750	5,500			—	—					
Johore Bahru steam power station	3	10,000	30,000	22 & 6.6	45	2	42,500	9,043	8,431	612	June 1963	Additional 132 kV transmission system being planned.
Prai steam power station	2	30,000	60,000	33 & 132	163	4	120,000	15,100	10,000	5,100	Dec. 1966	Estimate under column (10) only provisional.
Batang Padang hydro-electric	–	3×50,000 3× 1,400	154,200	...	...	...	...	...	...	...	1967/68	Construction started in 1963.
Upper Perak river hydro-electric	–	–	230,000	...	...	...	...	...	...	...	...	Under investigation.
Malim Nawar steam station extension	2	20,000	40,000	—	—	—	—	6,900	6,900	—	Jan. 1965	One set due for commissioning in November 1964.
North Borneo (Sabah)												
Labuan, diesel	1	495	1,485	6.6	...	...	...	52.2	52.2	...	1963	Existing units are included in total plant capacity.
Jesselton, diesel	1	1,500	4,250	22	29	5	1,200	261.2	130.6	130.6	"	
Tawau, diesel	1	500	1,500	6.6	...	...	...	52.2	52.2	...	"	
Tenom, diesel	1	140	290	...	...	...	...	13.1	13.1	...	"	
Sarawak												
Various stations throughout the system	8	2×1,350 6× 150	3,600	11 6.6	40	28	4,300	1,360	850	510	...	Throughout the system approved projects only.
Singapore												
St. James power station	6	6,000	36,000					6,200	6,200			
Pasir Panjang 'A' extensions	1	25,000	25,000					3,720	3,720			
Pasir Panjang 'B' (New power station)	4	60,000	240,000					7,500	7,500		1.9.65	1st machine
Transmission				66 22 6.6	84.5 18.85 34.41	5 3 26	220,000 7,000 29,600	4,160 1,190 3,560		4,160 1,190 3,560[d]	1.6.65	1st phase

Table 15 *(Cont'd)*

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission system: Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission system: Transmission and sub-transmission lines: Route length (km) (6)	Transmission system: Main sub-stations: Number of stations (7)	Transmission system: Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost (thousand US$): Generating station[b] (10)	Estimated cost (thousand US$): Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
NEPAL												
Karnali, hydro-electric	...	...	1,300,000	...	...	...	...	...	...	...	...	
Koshi, hydro-electric	...	...	...	...	...	1	...	...	...	...	1970	Expecting 10,000 kW supply from India.
Kali, hydro-electric	...	...	30,000	...	...	...	...	...	...	...	...	Planning stage.
Kathmandu, diesel	1	1,470	1,470	11	...	1	...	...	...	...	1964	
Kukkari, hydro-electric	...	...	18,000	...	...	...	...	...	...	...	...	
Gandak, hydro-electric	...	...	...	...	...	1	...	...	...	...	...	Expecting 10,000 kW supply from India.
Hitauda, diesel	3	1,470	4,410	66 & 11	80	1	...	600	...	...	1964	
Panauti, hydro-electric	3	800	2,400	33 & 11	30	1	...	1,600	...	...	1964	
Trishuli, „ „	6	3,000	18,000	66 & 11	32	1	...	11,000	...	...	1965	
Pokhara, „ „	2	250	500	11	15	1	...	300	...	...	1964	
NEW ZEALAND												
Benmore hydro-electric	...	...	360,000	500 DC	354	converter equipped at Benmore and Haywards		135,700	86,200	49,500	Apr. 1965	Including inter-island connexion; plant capacity will be extended to 540 MW in 1966.
Manapuri „ „	...	...	200,000	220 AC	...	2 plus extension to existing ones		91,300	74,000	17,300	Apr. 1968	
Aratiatia „ „	...	...	90,000	...	...	...	...	24,950	24,950	...	June 1964	Power will be fed into existing transmission line net-work with extensions as required.
Matahina „ „	...	...	70,000	...	...	...	...	31,400	31,400	...	July 1967	
Aviemore „ „	...	...	220,000	...	...	...	...	61,500	61,500	...	Apr. 1970	
PHILIPPINES												
Hydro-electric												
Angat river, Bulacan	4 2	50,000 4,000	208,000	115	33.5	1	265,000	66,000	62,500	3,500	Dec. 1965	Multiple purpose, cost of power phase.
Marikina river, Rizal	2 1	30,500 7,600	68,600	115	27	1	76,400	12,000	11,000	1,000	Dec. 1965	Multiple purpose, cost of power phase only.
Agus river No.2, Lanao	2	50,000	100,000	69	17	1	128,000	16,700	15,100	1,600	June 1966	
Agus river No.6, Unit 3, Lanao	1	50,000	50,000	69	3	1	64,400	7,000	6,000	1,000	„ 1965	
Quinale river, Albay	1	2,000	2,000	34.5	22	8	3,350	1,300	700	600	„ 1965	
Talomo river No.4, Davao	2	1,000	2,000	13.2	3	...	2,560	800	780	20	„ 1965	
Thermal No.1	1	95,000	75,000	...	...	1	...	13,390	10,390	3,000	July 1966	

Table 15 (Cont'd)

Name and location of the project (1)	Generating station: Number of generating units (2)	Generating station: Unit capacity (kW) (3)	Generating station: Total plant capacity (kW) (4)	Transmission and sub-transmission lines: Voltage (kV) (5)	Transmission and sub-transmission lines: Route length (km) (6)	Main sub-stations: Number of stations (7)	Main sub-stations: Aggregate transformer capacity (kVA) (8)	Estimated cost (thousand US$): Total (9)	Estimated cost: Generating station[b] (10)	Estimated cost: Transmission system[c] (11)	Anticipated date of completion (12)	Remarks (13)
THAILAND												
Yanhee hydro-electric station at Bhumiphol dam, Tak province . . .	8	70,000	560,000	230	444	...	...	107,000	81,394	25,606	1964	Initial stage 2 units
								111,372	26,783	84,589	...	Future stages 6 units
North Bangkok steam power station extention, 2nd unit	1	75,000	75,000	69	...	...	...	13,000	13,000	—	Aug. 1963	Total station capacity 150 MW; will be tied in with transmission line from Yanhee hydro-electric station.
Steam station at lignite colliery, Krabi .	2	20,000	40,000	115	600	9	66,000	12,490	8,512	3,978	1st unit 1963	
Nam Pong hydro-electric, Khon Kaen .	2	12,500	25,000	115 22	446 88	5	35,000	...	...	...	1965	Investigation completed; loan agreement made in December 1962.
Nam Pung, hydro-electric, Sakonnakorn	2	2,800	5,600	69 22	100 100	5	...	...	...	...	Aug. 1965	
Pattani hydro-electric	3	9,000	27,000	115	108	2	...	...	...	...	Dec. 1966	
VIET-NAM, REPUBLIC OF												
Danhim hydro-electric (1st stage)	2	40,000	80,000	230	252			49,000	...	...	1st stage early 1964	Under construction.
(2nd stage)	2	40,000	80,000								2nd stage 1965	
Thuduc thermal	1	33,000	33,000	66/15	50.3			12,700	...	...	1963	
An-Hoa thermal	2	13,500	27,000	...	...	...	...	...	...	...	...	
WESTERN SAMOA												
Fuluasov diesel	1	534	534					...	...	...	1963	
Fuluason-Lalovaca 6.6 kV sub-transmission line				6.6	4.14	1	—	...	...	...	1964	No transformer in the substation.
East coast 6.6 kV distribution lines . . .				6.6	5.5	5	100	...	...	...	1964/65	

[a] No data available for Australia, Cambodia, Mongolia and Pakistan. No power development schemes in Brunei.

[b] Including cost of land, civil engineering works (tunnels, dams, etc), power house, switchyard, electrical and mechanical equipment etc. pertaining to generating station.

[c] Including costs of land, transmission lines and sub-stations, etc., pertaining to transmission system.

[d] Including repairs, maintenance and replacements to existing sub-stations.

Table 16: ASSETS OF PUBLIC ELECTRICITY SUPPLY UNDERTAKINGS, 1956 TO 1961[a]

Country and year (1)	Total installed generating capacity (thousand kW)		Total value of assets at the end of the year		Value of assets per kW of installed capacity (US$) (6)
	Government (2)	Private (3)	Government (US$ thousand) (4)	Private (US$ thousand) (5)	
Australia					
1962	6,848.0	367.0	698,000	42,800	103
1961	6,299.0	366.0	888,000	45,900	140
1960	5,677.0	276.0	859,000	27,150	148
1959	5,243.0	288.0	778,000	24,200	145
1958	4,594.0	287.0	694,000	18,600	146
1957	4,418.0	287.0	634,000	18,200	139
Brunei					
1962	4.3	—	1,440	—	335
1961	3.2	—	1,440	—	444
1960	3.2	—	1,276	—	399
1959	3.2	—	1,274	—	399
1958	2.2	—	1,230	—	560
1957	1.2	—	973	—	810
1956	1.4	—	774	—	553
Burma[b]					
1962[c]	84.0	—	37,300	—	444.0
1961[d]	129.4	—	41,100	—	318.0
1960[d]	128.1	—	35,700	—	279.0
1959[e]	44,5	—	3,180	—	72.3
1958[e]	43.2	—	2,360	—	54.6
1957[e]	36.4	—	1,100	—	30.6
Cambodia					
1959	2.1	18.1	...	2,375	131[f]
1958	2.0	15.5	...	1,980	127.5[f]
1957	1.5	10.3	...	...	...
1956	1.5	10.1	...	...	...
Ceylon[g]					
1962	106.0	—	69,300	—	652.0
1961	81.0	—	59,700	—	737.0
1960	81.0	—	53,300	—	658.0
1959	81.0	—	49,800	—	615.0
1958	79.0	—	46,100	—	583.0
1957	63.2	—	39,000	—	617.0
1956	46.7	—	30,300	—	653.0
China (Taiwan)					
1962	923.4	—	252,065	—	273
1961	923.4	—	247,589	—	268
1960	709.2	—	197,077	—	278
Hong Kong					
1962	—	425.0	—	246,452.5	580
1961	—	365.0	—	202,598.5	554
1960	—	365.0	—	167,194.7	458
1959	—	335.0	—	148,210.9	442
1958	—	245.0	—	122,943.7	502
1957	—	190.0	—	98,525.9	519
India[h]					
1961	3,676.7[i]	1,340.1	...	...	...
1960	3,223.4[i]	1,355.6	1,258,000[i]	336,000	348
1959	2,572.3[i]	1,300.8	1,190,000[i]	309,000	387
1958	2,216.2[i]	1,295.4	1,078,000[i]	299,000	393
1957	1,937.7[i]	1,285.4	896,000[i]	284,000	366
1956	1,683.5[i]	1,202.6	827,000[i]	258,000	336
Japan[h]					
1962	—	25,503	—	7,277,100	285.0
1961	—	22,755	—	6,843,539	301.0
1960	—	20,649	—	5,658,564	274.0
1959	—	18,424	—	4,699,267	254.5
1958	—	15,777	—	4,162,858	264.0
1957	—	14,291	—	3,604,836	252.4
1956	—	13,081	—	3,029,994	231.8
Korea, Republic of[j]					
1962	—	434.0	—	86,728	199.5
1961	—	367.2	—	71,669	195.5
1960	—	367.2	—	44,293	121.0
1959	—	367.2	—	44,095	120.0
1958	—	367.2	—	44,759[k]	122.0
1957	—	367.2	—	7,093	19.4

Table 16 *(Cont'd)*

Country and year (1)	Total installed generating capacity (thousand kW) Government (2)	Private (3)	Total value of assets at the end of the year Government (US$ thousand) (4)	Private (US$ thousand) (5)	Value of assets per kW of installed capacity (US$) (6)
Malaysia:					
Former Fed. of Malaya					
1962	192.2	106.8	128,000	12,390	503
1961	202.9	112.4	106,000	...	522[k]
1960	192.1	105.5	92,700	11,020	348
1959	195.9	111.1	81,600	...	417[k]
1958	166.0	98.8	72,700	25,650	317
1957	170.2	86.7	65,200	22,500	342
1956	130.3	86.4	59,150	20,940	369
North Borneo (Sabah)					
1962	11.2	0.1	3,080	63.3	338
1961	9.7	0.1	2,490	54.6	260
1960	7.8	0.1	1,960	33.6	251
1959	5.7	0.1	1,340	8.5	233
1958	3.6	2.0	700	...	194.5[l]
1957	2.3	2.0	317	...	137[l]
Sarawak[m]					
1962	11.3	...	4,310	...	382.0
1962	10.6	...	4,100	...	386.0
1961	10.5	...	3,540	...	337.0
1960	9.2	...	3,340	...	341.0
1959	6.0	...	3,140	...	403.0
1958	6.0	...	1,880	...	312.0
1957	5.9	...	1,410	...	239.0
Singapore					
1961	188.0	—	78,400	—	416.0
1960	188.0	—	75,500	—	401.0
1959	152.0	—	72,300	—	476.0
1958	152.0	—	65,700	—	432.0
1957	164.0	—	61,600	—	375.0
1956	164.0	—	55,300	—	338.0
New Zealand[h]					
1962	1,814.6	...	910,000	...	502
1961	1,565.8	...	841,000	...	538
1960	1,509.4	...	774,000	...	512
1959	1,360.0	...	699,000	...	514
1958	1,201.0	...	638,000	...	532
1957	1.205.2	...	565,000	...	469
Philippines					
1962	284.4	376.7	76,700[n]	98,800	265.0
1961	282.9	369.7	143,259[n]	164,266	472.0
1960	280.0	316.4	139,331[n]	149,242	485.0
1959	179.3	250.4	135,212[n]	121,604	535.0
1958	176.1	243.9	110,996[n]	106,356	516.0
1957	174.2	218.5	93,393[n]	96,571	483.0
1956	148.7	221.9	85,372[n]	91,962	478.0
Viet-Nam republic of					
1960[o]	4.3	...	630	...	147.0
1959	...	78.1	...	27,300	350.0
1958	...	72.6	...	23,600	325.0
1957	...	67.9	...	21,800	321.0
1956	...	66.0	...	20,200	306.0

[a] All figures are as furnished by country authorities. As the basis for compilation of the figures is not the same in all cases, the figures are not readily comparable. The exchange rates are shown in the explanatory note on page viii.
No data available for Afghanistan, Indonesia, Iran, Laos, Mongolia Nepal, Pakistan, Thailand and Western Samoa.
No 1960 data available for Cambodia.
No 1961 data available for Cambodia and the Republic of Viet-Nam.
No 1962 data available for Cambodia, India, Singapore and the Republic of Viet-Nam.
Data for China (Taiwan) available only for 1960, 1961 and 1962.

[b] Relating to fiscal year ended 30 September of the specified year.

[c] Relating only to the Hydel Department of the Electricity Supply Board.

[d] Relating to the Hydel Department and Electrical and Mechanical Department of the Electricity Supply Board.

[e] Relating only to the Electrical and Mechanical Department of the Electricity Supply Board.

[f] Relating to private undertakings only.

[g] Relating to the Department of Government Electrical Undertakings only.

[h] Relating to fiscal year ended 31 March of subsequent year.

[i] Relating to Government and municipalities.

[j] Exchange rate 130 Won (1,300 Hwan) to 1 US$; previous exchange rate 650 Hwan to 1 US$ no longer applicable.

[k] Including an increase by revaluation of company's assets in 1958.

[l] Relating only to Government.

[m] The first line of 1962 relating to the year ended December 1962, the second line and all the rest relating to financial year ended 30 June of the specified years.

[n] Assets of the National Power Corporation being net value (excluding depreciation).

[o] Relating only to O.N.D.E.E.

Table 17: GROSS REVENUE REALIZED BY PUBLIC UTILITY ELECTRICITY SUPPLY UNDERTAKINGS, 1956 TO 1962[a]

Country and year (1)	Total generation (million kWh)		Total sales (million kWh)		Gross revenues realized (US$ thousand)			Gross revenue per kWh sold (US cents) (9)
	Government (2)	Private (3)	Government (4)	Private (5)	Government (6)	Private (7)	Total (8)	
Afghanitan								
1961	107.00	...	58.00	...	1.5	...	1.5	2.58
Australia								
1962	24,265	1,188	20,658	1,053	253,000	15,100	268,100	1.24
1961	22,744	1,211	19,459	1,125	247,000	17,230	264,230	1.29
1960	21,016	1,205	17,870	1,128	231.500	17,440	248,940	1.31
1959	19,283	1,105	16,413	1,033	218,000	15,950	233,950	1.34
1958	17,975	1,065	15,342	993	204,500	14,800	219,300	1.34
1957	16,530	1,063	14,066	1,000	192,500	16,190	208,690	1.38
Brunei								
1962	11.11[b]	—	10.14	—	438.0	—	438.0	4.32
1961	10.30[b]	—	9.50	—	414.0	—	414.0	4.36
1960	9.13[b]	—	8.09	—	365.0	—	365.0	4.51
1959	8.03[b]	—	6.99	—	309.5	—	309.5	4.43
1958	6.59[b]	—	5.95	—	275.5	—	275.5	4.62
1957	4.89[b]	—	4.50	—	221.6	—	221.6	4.92
1956	3.42[b]	—	3.07	—	168.7	—	168.7	5.48
Burma[c]								
1962[d]	95.0	—	58.0		5,700	—	5,700	9.8
1962[e]	205.7	—	182.0		2,680	—	2,680	1.5
1961[d]	83.9	—	51.2		5,570	—	5,570	10.9
1961[e]	180.1	—	159.2		2,920	—	2,920	2.1
1960[d]	69.5	—	44.9	—	5,440	—	5,440	12.1
1960[e]	69.6	—	62.3	—	1,180	—	1,180	1.9
1959[d]	65.0	—	38.4	—	4,400	—	4,400	11.5
1958[d]	55.5	—	35.0	—	3,500	—	3,500	10.0
1957[d]	41.3	—	30.0	—	2,820	—	2,820	9.4
1956[d]	29.1	—	22.7	—	2,030	—	2,030	8.9
Cambodia								
1962	79.9	2.4	60.1	2.0	...	...	...	...
1959	2.4	48.6	1.6	39.0	...	3,660	...	9.38[f]
1958	1.7	42.3	1.3	34.3	...	3,048	...	8.88[f]
1957	1.8	37.9	1.1	35.6	...	...	...	...
1956	1.4	33.0	1.3	29.8	...	...	...	...
Ceylon[g]								
1962	329.6	—	271.8	—	8,140	—	8,140	3.00
1961	291.2	—	242.9	—	7,590	—	7,590	3.12
1960	271.1	—	226.0	—	6,890	—	6,890	3.05
1959	233.5	—	193.6	—	6,030	—	6,030	3.12
1958	199.3	—	168.1	—	5,310	—	5,310	3.16
1957	180.5	—	156.3	—	4,880	—	4,880	3.13
1956	162.5	—	137.0	—	4,410	—	4,410	3.22
China (Taiwan)[h]								
1962	4,693.0	—	4,065.0	—	46,216	—	46,216	1.00
1961	4,084.0	—	3,528.0	—	28,083	—	28,083	0.80
1960	3,628.0	—	3,136.0	—	33,682	—	33,682	1.07
1959	3,212.8	—	2,769.8	—	24,046	—	24,046	0.87
1958	2,880.3	—	2,416.4	—	29,581	—	29,581	1.22
1957	2.555.2	—	2,084.4	—	25,235	—	25,235	1.21
1956	2,249.8	—	1,769.9	—	19,913	—	19,913	1.13
Hong Kong[i]								
1962	—	596.3	—	517.5	—	13,756.0	13,756.0	2.66
1961	—	530.1	—	460.9	—	12,345.1	12,345.1	2.68
1960	—	466.1	—	402.7	—	10,982.0	10,982.0	2.73
1959	—	415.8	—	359.7	—	10,009.1	10,009.2	2.78
1958	—	378.0	—	324.3	—	9,364.4	9,364.4	2.89
1957	—	349.4	—	301.8	—	8,922.7	8,922.7	2.96
1956	—	308.3	—	263.4	—	7,528.9	7,528.9	2.85

Table 17 *(Cont'd)*

Country and year (1)	Total generation (million kWh) Government (2)	Total generation (million kWh) Private (3)	Total sales (million kWh) Government (4)	Total sales (million kWh) Private (5)	Gross revenues realized (US$ thousand) Government (6)	Gross revenues realized (US$ thousand) Private (7)	Gross revenues realized (US$ thousand) Total (8)	Gross revenue per kWh sold (US cents) (9)
India[j]								
1962								
1961	13,728[k]	5,942	10,779[k]	5,669	...	...	...	...
1960	11,017[k]	5,921	8,375[k]	5,465	157,000[k]	91,800	248,800	1.94
1959	9,527[k]	5,506	7,388[k]	5,019	129,700[k]	82,600	212,300	1.71
1958	7,983[k]	5,011	6,147[k]	4,572	109,100[k]	75,200	184,300	1.72
1957	6,830[k]	4,539	4,872[k]	4,558	88,900[k]	68,200	157,100	1.67
1956	5,295[k]	4,367	3,635[k]	4,324	51,800[k]	62,400	114,200	1.44
Japan[j]								
1961	—	116,810	—	101,490	—	1,628,386	1,628,386	1.60
1960	—	102,324	—	87,734	—	1,279,511	1,279,511	1.46
1959	—	86,756	—	73,404	—	1,078,000	1,078,000	1.47
1958	—	74,603	—	62,705	—	924,000	924,000	1.47
1957	—	70,175	—	58,518	—	845,000	845,000	1.44
1956	—	62,499	—	51,321	—	732,000	732,000	1.43
Korea, Republic of[l]								
1962	—	1,978.5	—	1,469.1	—	40,174	40,174	2.74
1961	—	1,772.9	—	1,212.7	—	30,277	30,277	2.50
1960	—	1,696.9	—	1,136.2	—	21,307	21,307	1.88
1959	—	1,686.2	—	1,072.4	—	20,990	20,990	1.96
1958	—	1,511.7	—	921.6	—	16,968	16,968	1.84
1957	—	1,323.0	—	765.9	—	14,479	14,479	1.89
Laos								
1961	8.0	—	5.8	—	...	...	...	...
1960	6.9	—	5.1	—	...	...	...	...
1959	5.8	—	4.7	—	721.0	—	721.0	15.3
1958	4.1	—	2.8	—	364.5	—	364.5	13.0
1957	3.4	—	2.3	—	311.0	—	311.0	13.6
1956	2.7	—	1.8	—	261.4	—	261.4	14.5
Malaysia:								
Former Federation[m] *of Malaya*								
1962	918.1	537.2	782.0	471.8	24,500	8,650	33,150	2.65
1961	717.2	...	606.7	...	18,600	...	18,600	3.07
1960	621.9	386.7	524.7	337.4	16,300	5,910	22,210	2.58
1959	523.8	264.2	435.2	230.3	13,500	3,910	17,410	2.62
1958	539.0	377.0	447.7	331.8	13,500	6,050	19,550	2.51
1957	479.2	443.7	397.2	387.0	12,260	7,050	19,310	2.46
1956	415.9	436.2	337.6	379.0	11,000	6,430	17,430	2.43
North Borneo (Sabah)								
1962	22.9	...	20.4	...	1,166	...	1,166	5.70
1961	18.5	...	16.5	...	988	...	988	5.98
1960	15.6	...	13.7	...	840	...	840	6.12
1959	10.7	...	9.5	...	606	...	606	6.39
1958	6.6	...	5.8	...	396	...	396	6.83
1957	4.5	...	3.9	...	256	...	256	6.57
Sarawak[n]								
1962	25.0	...	20.9	...	1,380	...	...	6.61
1961	20.7	...	17.5	...	1,326	...	...	7.57
1960	17.4	...	14.6	...	1,100	...	...	7.54
1959	14.8	...	12.4	...	973	...	...	7.85
1958	13.3	...	11.3	...	916	...	...	8.10
1957	11.0	...	9.3	...	803	...	...	8.65
1956	9.1	...	7.8	...	663	...	...	8.50
Singapore								
1962	775.7	—	689.6	—	...	—	...	...
1961	719.6	—	636.6	—	16,200	—	16,200	2.54
1960	658.5	—	577.7	—	14,900	—	14,900	2.58
1959	616.1	—	524.7	—	13,910	—	13,910	2.65
1958	571.3	—	492.5	—	13,110	—	13,110	2.66
1957	496.9	—	438.4	—	10,780	—	10,780	2.46
1956	434.0	—	376.7	—	9,380	—	9,380	2.49

Table 17 *(Cont'd)*

Country and year (1)	Total generation (million kWh) Government (2)	Private (3)	Total sales (million kWh) Government (4)	Private (5)	Gross revenues realized (US$ thousand) Government (6)	Private (7)	Total (8)	Gross revenue per kWh sold (US cents) (9)
Nepal								
1960	9.7	...	5.6	...	125.0	...	125.0	2.23
1959	8.2	1.2	...	...	103.0	47.5	150.5	1.60[o]
1958	8.3	2.1	...	...	100.0	69.8	169.8	1.63[o]
1957	7.9	1.5	...	...	87.1	59.3	146.4	1.56[o]
1956	7.2	0.8	...	...	86.1	35.8	121.9	1.52[o]
New Zaland[j]								
1962	7,399	...	6,169	...	97,800	...	97,800	1.59
1961	6,835	...	5,684	...	90,000	...	90,000	1.59
1960	6,361	...	5,274	...	85,100	...	85,100	1.62
1959	5,677	...	4,702	...	77,500	...	77,500	1.65
1958	5,644	...	4,653	...	61,500	...	61,500	1.32
1957	4,967	...	4,064	...	40,200	...	40,200	0.99
Philippines								
1962	1,199.5	1,810.5	355.1[p]	2,174.4	3,050.0[p]	36,500.0[q]	39,550.0[p]	1.57[p]
			1,164.4[r]		8,340.0[r]		44,840.0[r]	1.34[r]
1961	1,143.4	1,411.9	307.3[p]	1,893.0	4,604.8[p]	60.457.3[q]	65,062.1[p]	2.96[p]
			1,387.8[r]		16,917.9[r]		77,375.2[r]	2.36[r]
1960	1,161.4	1,098.1	249.7[p]	1,637.3	3,884.3[p]	55,866.3[q]	59,750.6[p]	3.17[p]
			1,102.4[r]		13,154.1[r]		69,020.4[r]	2.52[r]
1959	648.3	1,375.1	282.3[p]	1,421.4	3,878.0[p]	47,420.0[q]	51,298.0[p]	3.01[p]
			618.1[r]		8,649.3[r]		56,069.3[r]	2.74[r]
1958	704.1	1,049.3	260.2[p]	1,214.5	3,506.2[p]	40,610.3[q]	44,116.5[p]	2.99[p]
			673.2[r]		8,361.7[r]		48,972.0[r]	2.59[r]
1957	642.6	849.8	186.9[p]	1,051.1	2,486.5[p]	35,428.5[q]	37,915.0[p]	3.06[p]
			614.9[r]		7,372.5[r]		42,801.0[r]	2.57[r]
1956	434.3	838.8	160.7[p]	848.1	3,015.5[p]	31,428.5[q]	34,444.2[p]	3.41[p]
			411.0[r]		5,495.4[r]		36,894.2[r]	2.93[r]
Thailand								
1962	681.9	18.4	530.8	12.9	15,350	1,680	17,030	3.14
1961	583.6	18.2	454.1	12.4	17,490	1,770	19,260	4.12
1960	486.0	15.4	383.5	11.1	14,270	1,750	16,020	4.06
Viet-Nam, Republic of								
1962	23.4	351.5	20.3	287.6	2,310	29,100	31,410	10.20
1960	[s]	304.0	[t]	250.0	...	...	...	...
1959	...	267.2	3.5	217.0	1,000	17,130	18,130	8.22
1958	...	238.4	3.0	191.6	893	19,000	19,893	10.22
1956	...	206.4	3.5	166.7	803	16,030	16,833	9.99
Western Samoa								
1962	5.7	—	4.5	—	156.0	—	156.0	3.47
1961	4.9	—	4.0	—	134.6	—	134.6	3.36
1960	4.4	—	...	—	127.8	—	127.8	...

[a] All figures are as given by country authorities. In some cases, revenue figures probably include income by means other than sale of power.
Exchange rates are shown in the explanatory note in page viii.
Data not available for Indonesia, Iran, Mongolia and Pakistan.
No 1960 data available for Cambodia.
No 1961 data available for Cambodia, Nepal and Republic of Viet-Nam.
No 1962 data available for India, Japan, Laos and Nepal.
Data for Afghanistan available only for 1961.
Data for Thailand and Western Samoa available only for 1960, 1961 and 1962.

[b] Including energy purchased from bulk supply.

[c] Relating to fiscal year ended 30 September of the specified year.

[d] Relating to Electricity Supply Board, Electrical and Mechanical Department.

[e] Relating to the Balu Chaung hydro-electric plant of Electricity Supply Board, Hydel Department.

[f] Relating to public undertakings only.

[g] Relating to the Department of Government Electrical Undertakings only.

[h] The following weighted average exchange rates are used per US$
1956 : NT$24.78 1958 : NT$26.42 1960 : NT$38.21
1957 : NT$24.78 1959 : NT$36.38 1961, 1962 : NT$40.03

[i] Relating to Hong Kong Electric Co. Ltd., only.

[j] Relating to fiscal year ended 31 March of subsequent year.

[k] Relating to Government and municipalities.

[l] Exchange rate 130 Won (1,000 Hwan) to US$1.-; previous exchange rate 650 Hwan to US$1 no longer applicable.

[m] Figures under columns (3), (5) and (7) relating only to Perak River Hydro-electric Power Company Ltd.

[n] Relating to financial year ended 30 June of the specified year.

[o] Gross revenue per kWh generated.

[p] Excluding National Power Corporation's (NPC) sales to utilities.

[q] Including sales of NPC purchased energy.

[r] Including NPC sales to utility.

[s] Included in column (3).

[t] Included in column (5).

Table 18: COMPARATIVE ELECTRICITY TARIFF RATES

Note: The tariff schedules of different undertakings do not lend themselves to comparison with one another as they generally involve various terms and conditions which are not comparable. Nevertheless, in order to obtain a broad idea of the relative level of electricity rates, an attempt has been made to work out the amount of the electricity bill for different categories of consumers and for different levels of consumption on the basis of prevailing tariff schedules of the various undertakings. The average rate per kWh thus arrived at is tabulated below.

The figures in the table are good enough for purposes of broad comparison only and should not be regarded too strictly. The figures are in most cases worked out from the basic tariff rates in the published tariff schedules. It may be necessary to modify these figures for various conditions such as rebates for prompt payment, adjustment for fuel cost variations, penalty or other adjustment for power factor conditions. Some tariff schedules take into account the number of rooms and/or the area of floor space in the premises for working out the rate. In some cases, certain special methods are specified for working out the chargeable maximum demand. All such special conditions have not been taken into account in the present tabulation.

A. Countries in the ECAFE region

(a) *Domestic lighting consumers*[a]

Countries and undertakings	*Average rate in US cents per kWh for a monthly consumption of* 10 kWh	30 kWh	50 kWh	100 kWh	*Remarks*
Afghanistan					
Kabul	2.27	2.27	2.27	2.27	
Kandahar	6.02	6.02	6.02	6.02	
Mazar-i-Shariff	9.05	9.05	9.05	9.05	
Australia					
Brisbane City Council	8.78	5.22	3.92	2.94	Tariffs based on consumption per quarter.
Sydney City Council	5.98	4.7	3.66	2.68	Tariffs based on consumption per quarter.
State Electricity Commission of Victoria	2.05	2.05	2.05	2.05	Standard metropolitan tariffs, service charge US¢16.8 for each assessable room.
Brunei	8.17	8.17	8.17	8.17	Flat rate applicable to all lighting consumers.
Burma					
Rangoon Electric Supply	9.45	9.45	9.45	9.45	This is a general purpose tariff. With consumption above 100 kWh, the rate decreases as follows: First 100 kWh — 9.45 ¢; Next 200 kWh — 8.84 ¢; Next 500 kWh — 8.41 ¢; All over 800 kWh — 7.56 ¢
Cambodia					
Phnom-Penh	9.75	9.75	9.75	9.75	
Battambang	20.70	20.70	20.70	20.70	
Kandal	10.00	10.00	10.00	10.00	
Provincial	20.50	20.50	20.50	20.50	
Ceylon					Variable block domestic tariff based on the external floor area of the premises:
	6.30	5.16	4.10	3.31	For floor area less than 2,000 sq ft.
	6.30	5.93	4.56	3.54	For floor area between 2,000-2,500 sq ft.
	6.30	6.30	5.03	3.77	For floor area between 2,500-3,000 sq ft.
China (Taiwan)					
Taiwan Power Company	1.80	1.80	1.80	1.80	
Hong Kong					
Hong Kong Electric Co. Ltd., Hong Kong	4.90	4.90	4.90	4.90	Subject to 9 per cent fuel surcharge.
China Light & Power Co. Ltd., Kowloon	5.08	5.08	5.08	5.08	Subject to 9 per cent fuel surcharge.
India					
Madras State Electricity Board	6.10	6.10	6.10	5.67	
Kerala State Electricity Board	6.30	6.30	6.30	6.30	
Mysore State Electricity Board	5.25	3.99	3.74	3.55	Applicable also to small household appliances.
Madhya Pradesh State Electricity Board (Southern Grid)	5.90	5.90	5.43	5.00	— do —
Bombay State Electricity Board	6.90	6.30	5.88	5.56	
Delhi Electric Supply Undertaking	3.78	3.78	3.78	3.78	10% rebate allowed where monthly consumption does not exceed 100 kWh.
Punjab State Electricity Board	6.57	4.60	3.55	2.42	Same as domestic power tariff.
Orissa Hirakud	5.26	5.26	5.26	5.26	

Table 18 A. *(Cont'd)*

(*a*) *Domestic lighting consumers*[a]

Countries and undertakings	*Average rate in US cents per kWh for a monthly consumption of* 10 kWh	30 kWh	50 kWh	100 kWh	*Remarks*
Indonesia					
Java	An average overall rate of 3.41 US cents is reported				No detailed information available.
Other islands	An average overall rate of 4.26 US cents is reported				
Iran					
Isfahan-Turbine Co.	3.30	3.52	3.69	3.83	Single phase low voltage supply, tax extra at 1.32 US¢ per kWh.
Khuzistan	9.90	3.30	3.04	2.84	Tax extra at 50% of the bill.
Tehran	4.61	4.61	4.61	4.61	Night consumption, tax extra at 1.32 US¢ per kWh for consumption in excess of 50 kWh.
	1.98	1.98	1.98	1.98	Day consumption, tax extra as follows: Up to 1,000 kWh monthly consumption 0.66 US¢ per kWh. Over 1,000 kWh monthly consumption 0.33 US¢ per kWh. Subscription fee: 13.2 US¢ for every meter with a maximum monthly consumption of 100 kWh.
Shiraz	6.60	6.60	6.60	6.60	Peak hours consumption, 6 p.m. to 11 p.m. — Tax extra at 1.32 US¢ per kWh
	3.30	3.30	3.30	3.30	Offpeak consumption — Tax extra at 1.32 US¢ per kWh
Japan					
Hokkaido Electric Power Co.	5.56	3.71	3.33	3.33	Based on the assumption that consumption of 10 kWh, 30 kWh and 50 kWh corresponds to 5 ampere contract and consumption of 100 kWh corresponds to 10 ampere contract.
Tohoku " " "	5.36	3.51	3.14	3.14	
Tokyo " " "	4.58	2.82	2.82	3.33	
Chubu " " "	5.42	3.66	3.31	3.31	
Hokuriku " " "	5.09	3.42	3.08	3.08	
Kansai " " "	4.86	3.22	3.14	3.07	
Chugoku " " "	5.56	3.48	3.31	3.18	
Shikoku " " "	5.14	3.35	3.23	3.15	
Hyushu " " "	5.97	4.98	4.20	3.60	
Korea, Republic of	4.26	3.37	3.19	3.05	The tariff includes a fixed charge based on the number of bulbs used. Figures based on the assumption that lamps of an average size of 60 watts are used for 4 hours a day.
Laos					
Luangprabang	18.25	18.25	18.25	18.25	
Vientiane	17.00	17.00	17.00	17.00	
Thakhek	18.75	18.75	18.75	18.75	
Savannakhet and Pakse	18.10	18.10	18.10	18.10	
Malaysia:					
Former Federation of Malaya					
Central Electricity Board:					
Central network	8.83	8.83	6.87	4.74	Combined rates for lighting, fans and all domestic purposes.
Johore Bahru, Province Wellesley, Parit Buntar and Bandar Bahru	8.83	8.83	6.87	4.86	
Ipoh, Batu Gajah, Tanjang Rambutan	8.16	8.16	6.47	4.48	
Penang Municipality	7.85	6.54	5.49	3.97	Common tariff for domestic lighting and power.
Kinta Electrical Distribution Co. Ltd.	10.13	10.13	10.13	10.13	Applicable to supply from oil engine stations.
	8.50	8.50	8.50	8.50	Applicable to supply from steam and hydro-electric stations and redistribution of purchased power.
Perak River Hydro-Electric Power Co. Ltd	8.50	8.50	8.50	8.50	Rate for consumption in excess of 100 kWh — 6.86 US cents.
Huttenbachs Ltd.	10.12	10.12	10.12	10.12	Flat rate applicable to Alor Star, Sungei Putani, etc.; for other places flat rates are 9.48 US cents and 9.8 US cents.
North Borneo (Sabah)					Flat rate for consumers taking supply from undertakings of:—
	(1) 19.60	11.42	11.42	11.42	(1) over 1,000 kW installed capacity
	(2) 19.60	13.08	13.08	13.08	(2) 501 to 1,000 kW " " and
	(3) 24.50	16.35	16.35	16.35	(3) below 500 kW " " respectively; rates under 10 kWh consumption based on monthly minimum charges.

Table 18 A. *(Cont'd)*

(a) *Domestic lighting consumers*[a]

Countries and undertakings	*Average rate in US cents per kWh for a monthly consumption of* 10 kWh	30 kWh	50 kWh	100 kWh	*Remarks*
Sarawak					
Kuching and Sibu	9.80	9.80	9.80	9.80	
Miri and other places	11.40	11.40	11.40	11.40	
10th mile station	19.60	19.60	19.60	19.60	
Singapore					
Singapore Electricity Dept.	3.92	5.88	5.88	5.88	For consumption not exceeding 20 kWh per month a special rate of 3.92 US cents per kWh is offered.
Nepal	2.96	3.07	3.16	3.22	Rs. 2.25 for the first 11 kWh and 25 pice per kWh for all further consumption.
New Zealand					
Wellington City Corporation	4.46	2.14	1.68	1.33	Same tariffs as for domestic power. Meters are read and bills rendered once in two months in Wellington.
Auckland Electric Power Board	3.48	2.69	2.03	1.55	
Pakistan					
East Pakistan WAPDA					
Dacca	7.88	7.88	7.88	7.88	Flat rate for lights and fans; duty of 1 US cent per kWh extra for consumption exceeding 15 kWh per month; rebate for prompt payment 1.31 US cents per kWh in Dacca, Chittagong, Goalpara and Khulna and 0.65 US cents per kWh in Narayanganj.
Chittagong	8.88	8.88	8.88	8.88	
Goalpara and Khulna	10.50	10.50	10.50	10.50	
Narayanganj	8.55	8.55	8.55	8.55	
West Pakistan WAPDA	5.92	5.03	4.34	3.81	For all domestic purposes and applicable also to domestic appliances having motors of aggregate capacity not exceeding 4 kW.
Karachi	4.00	4.00	4.00	4.30	Applicable also to fans and small domestic appliances.
Philippines					
Manila Electric Company	5.12	3.41	3.07	2.30	Same as domestic power tariff.
Thailand					
Metropolitan Electricity Authority	4.46	4.21	4.08	3.96	Bangkok and Thonburi only.
Other electricity supply organizations	5.77	5.77	5.77	5.77	A variety of rates are currently in use.
	14.48	14.48	14.48	14.48	The maximum and minimum rates are indicated.
Viet-Nam, Republic of					
S.I.P.E.A.					
Hong Ha, Quang-Tr, Hue, Nha-Trong, Thap-Cham, Da-Nang and Hoi-An	19.10	19.10	19.10	19.10	Lighting and fans, flat rate.
Dalat (concession)	8.06	8.06	8.06	8.06	Lighting and fans, flat rate.
Nin-Hoa (monopoly)	21.40	21.40	21.40	21.40	Flat lighting rate.
Banmethuot (monopoly)	14.30	14.30	14.30	14.30	Flat lighting rate.
Di-Linh (monopoly)	16.45	16.45	16.45	16.45	Flat lighting rate.
Pleiku (monopoly)	11.42	11.42	11.42	11.42	Flat lighting rate.
C.E.E.					
Saigon-Cholon and 3 northern provinces	7.48	7.48	7.48	7.48	Flat lighting rate, ONDEE tax of 0.51 US cents per kWh extra.
S.C.E.E.					
Cantho, Phuvinh, Long Xuyen Sadec Khanh Hung	18.80	18.80	18.80	18.80	— do —
Vinh-Long	20.70	20.70	20.70	20.70	— do —
U.N.E.D.I.					
Bentre, Baria Vung Tau Phanthiet	19.10	19.10	19.10	19.10	— do —
My-Tho	22.80	22.80	22.80	22.80	— do —

Table 18 A. *(Cont'd)*

(a) *Domestic lighting consumers*[a]

Countries and undertakings	Average rate in US cents per kWh for a monthly consumption of 10 kWh	30 kWh	50 kWh	100 kWh	Remarks
S.A.E.R.					
Rach-Gia	18.00	18.00	18.00	18.00	Flat lighting rate for October, ONDEE tax of 0.57 cents per kWh extra.
Government Monopolies					
Tayning and Tan-Chau	20.00	20.00	20.00	20.00	Flat lighting rate, ONDEE tax of 0.57 US cents per kWh extra.
Cocong	18.50	18.50	18.50	18.50	
Caolanh	28.60	28.60	28.60	28.60	
Western Samoa	4.63	4.63	4.63	4.63	Discount of 1.16 US cents per kWh for prompt payment.

[a] No data available for Iran and Mongolia.

(b) *Domestic power consumers*[a]

Countries and undertakings	Average rate in US cents per kWh for a monthly consumption of 100 kWh	250 kWh	500 kWh	1000 kWh	Remarks
Afghanistan					
Kabul	2.27	2.27	2.27	2.27	Domestic heating loads at 1.19 cents.
Australia					
Brisbane City Council	2.94	2.22	1.86	1.68	
Sydney City Council	2.87	2.232	2.021	1.915	Tariff based on quarterly consumption.
State Electricity Commission of Victoria	3.06	2.455	2.25	2.16	Energy charge plus service charge based on number of rooms.
Brunei	8.17	8.17	8.17	8.17	Same as rate for lighting. No separate rate for domestic power quoted.
Burma					
Rangoon Electric Supply	4.66	3.76	3.46	3.31	Domestic power circuits to be metered separately
Ceylon					Variable block domestic traiff based on the external floor area of the premises:—
	3.31	2.31	1.89	1.68	For floor area less than 2,000 sq ft.
	3.54	2.56	2.02	1.75	For floor area 2,000-2,500 sq ft.
	3.77	2.81	2.14	1.80	For floor area 2,500-3,000 sq ft.
China (Taiwan)					
Taiwan Power Company	1.65	1.15			Installed capacity 1.0 kW Based on low tension two-part tariff.
	3.15	1.80	1.35	1.13	,, ,, 3.0 kW
			1.65	1.28	,, ,, 5 kW
Hong Kong					
Hong Kong Electric Co. Ltd.	2.10	2.10	2.10	2.10	Subject to 9% fuel surcharge.
China Light & Power Co. Ltd., Kowloon	2.28	2.28	2.28	2.28	
India					
Madras State Electricity Board	4.20	2.94	2.52	2.31	Connected load 2 kW.
	5.05	3.36	2.74	2.42	Connected load 3 kW.
Kerala State Electricity Board	2.52	2.52	2.52	2.52	For various domestic appliances and motors under 3 HP only.
	3.43	2.16	1.74	1.53	Combined power and lighting under all electric home tariff.
Mysore State Electricity Board	2.46	1.62	1.33	1.18	All electric home rate for bona fide domestic consumers only.
Madhya Pradesh Electricity Board (Southern Grid)	2.63	2.43	2.36	2.33	Applicable also to cottage industries having a connected load of 3 kW or less.
Bombay State Electricity Board	2.62	2.62	2.62	2.62	For domestic appliances up to 1 BHP when metered separately.
	3.93	3.41	3.14	2.88	Motive power service rate based on 4 BHP connected load.
Delhi Electric Supply Undertaking	1.47	1.47	1.47	1.47	For domestic appliances, refrigerators, air conditioners etc.
Punjab State Electricity Board	2.42	1.75	1.53	1.42	
Orissa, Hirakud Project area	2.73	2.73	2.73	2.73	Air conditioning, cooking and other power purposes.

Table 18 A. *(Cont'd)*

(*b*) *Domestic power consumers*[a]

Countries and undertakings	Average rate in US cents per kWh for a monthly consumption of 100 kWh	250 kWh	500 kWh	1000 kWh	Remarks
Indonesia					
Java	An average overall rate of 3.41 US cents is indicated				No detailed information available.
Other islands	An average overall rate of 4.26 US cents is indicated.				
Iran					
Isfahan-Turbine Co.	3.83	3.91	3.94	3.95	Single phase supply, tax extra at 1.32 US¢ per kWh.
Khuzistan	2.84	2.40	2.15	1.87	Tax extra at 5% of the bills.
Tehran	4.61	4.61	4.61	4.61	Night consumption; tax extra at 1.32 US¢ per kWh for consumption in excess of 50 kWh.
	1.98	1.98	1.98	1.98	Day consumption, tax extra as follows: Up to 1,000 kWh monthly consumption 0.66 US¢ per kWh. Over 1,000 kWh monthly consumption 0.33 US¢ per kWh. Subscription fee extra as follows: 13.2 US¢ for meter with maximum monthly consumption of 100 kWh, 66 US¢ for 500 kWh, US$1.06 for 800 kWh, US$1.32 for over 800 kWh.
Shiraz	6.60	6.60	6.60	6.60	Peak hours consumption, 6 p.m. to 11 p.m.
	3.30	3.30	2.64	2.64	Offpeak consumption.
Japan					
Hokkaido E.P. Co.	3.89	3.22	3.14	3.14	Based on the assumption that consumption of 100 kWh and 250 kWh correspond to 20 amp. lighting contract and those of 500 kWh and 1,000 kWh to large lighting services of 5 kW and 10 kW contract power respectively.
Tohoku E.P. Co.	3.70	3.03	3.14	3.14	
Tokyo E.P. Co.	3.83	3.22	3.56	3.56	
Chubu E.P. Co.	3.83	3.20	2.99	2.99	
Hokuriku E.P. Co.	3.58	2.99	2.92	2.92	
Kansai E.P. Co.	3.11	3.08	3.25	3.25	
Chugoku E.P. Co.	3.18	3.11	3.25	3.25	
Shikoku E.P. Co.	3.44	3.22	3.28	3.28	
Kyushu E.P. Co.	3.98	3.39	4.05	4.05	
Korea Republic of	2.61	2.47	2.43	2.40	Based on contracted power demand of 3 kW.
Laos					
Luangprabang	13.25	13.25	13.25	13.25	Motive power flat rates.
Vientiane	13.60	13.60	13.60	13.60	
Savannakhet	14.78	14.78	14.78	14.78	
Pakse	14.55	14.55	14.55	14.55	
Malaysia:					
Former Federation of Malaya					
Penang Municipality	3.97	3.06	2.75	2.60	Common tariff for domestic lighting and power.
Kinta Electrical Distribution Co. Ltd.	3.27	3.27	3.27	3.11	Applicable to supply from oil engine stations.
	2.62	2.62	2.62	2.62	Applicable to supply from steam and hydro-electric stations and redistribution of purchased power.
Perak River Hydro-Electric Power Co. Ltd.	2.62	2.62	2.62	2.62	Rate for consumption in excess of 2,000 kWh — 2.28 US cents.
Huttenbachs Ltd.	3.27	3.27	3.27	3.19	
North Borneo (Sabah)	3.27	3.27	3.27	3.27	Rate for air conditioners, separately metered, charged by power stations with installed capacity over 1,000 kW.
	6.13	4.41	3.84	3.55	All-in domestic tariff charged by power stations of over 1,000 kW installed capacity.
Sarawak					
Kuching and Sibu	5.43	4.13	3.70	3.48	
Miri	7.53	5.75	5.16	4.87	
7th mile and other places	5.55	5.36	4.96	4.76	
10th mile station	9.80	9.15	7.85	7.19	
Singapore	1.96	1.96	1.96	1.96	For all domestic appliances other than lighting and fans.

Table 18 A. *(Cont'd)*

(*b*) *Domestic power consumers*[a]

Countries and undertakings	Average rate in US cents per kWh for a monthly consumption of 100 kWh	250 kWh	500 kWh	1000 kWh	Remarks
Nepal	3.22	3.26	3.27	3.28	Rs. 11.25 for consumption of the first 11 kWh and 25 pice per kWh for all consumption in excess.
New Zealand					
Wellington City Corporation	1.33	1.159	1.052	1.019	Meters read and bills rendered once in two months.
Auckland Electric Power Board	1.55	1.265	1.162	1.119	
Pakistan					
East Pakistan WAPDA					
Dacca	3.28	3.28	3.28	3.28	Domestic power flat rate.
Chittagong	6.23	6.23	6.23	6.23	Rebate for prompt payment 0.65 US cents per kWh.
Goalpara and Khulna	5.25	5.25	5.25	5.25	
Narayanganj	4.60	4.60	4.60	4.60	Rebate for prompt payment 0.65 US cents per kWh.
West Pakistan WAPDA	3.81	3.43	3.36	3.32	Applicable to lighting, fans and domestic appliances having aggregate capacity not exceeding 4 kW.
Karachi	2.14	1.96	1.90	1.87	Applicable to refrigerators not exceeding 3 HP, cookers, heaters, pumps up to a total capacity of 3 HP and also other small domestic appliances; 3.125 per cent prompt payment discount granted.
Philippines					
Manila Electric Company	2.30	1.69	1.49	1.38	All-in domestic power tariff.
Thailand					
Metropolitan Electricity Authority	3.96	3.75	3.44	3.17	Bangkok and Thonburi only and applicable to all domestic appliances including lighting.
Other electricity supply organizaations	4.33 12.55	4.33 12.55	4.33 12.55	4.33 12.55	A variety of rates are currently in use. The maximum and minimum are indicated.
Viet-Nam, Republic of					
S.I.P.E.A.					
Hong Ha, Quang-Tr, Hue, Nha-Trong, Thap-Cham, Da-Nang and Hoi-An	16.20	16.20	16.20	16.20	Low tension power flat rate.
Dalat	7.75	7.75	7.75	7.75	All-in domestic flat rate.
	6.78	6.78	6.78	6.78	Low tension power flat rate.
S.C.E.E.					
Cantho, Phuvinh, Long Xuyen Sadec, Khanh Hung	13.95	13.95	13.95	13.95	Off-peak low tension power flat rate, ONDEE tax of 0.14 US cents per kWh extra.
Vinh-Long	17.80	17.80	17.80	17.80	— do —
U.N.E.D.I.					
Bentre, Baria Vung Tan Phanthiet	18.90	18.90	18.90	18.90	— do —
My-Tho	19.60	19.60	19.60	19.60	— do —
S.A.E.R.					
Rach-Gia	16.00	16.00	16.00	16.00	Off-peak low tension power flat rate for October, ONDEE tax of 0.14 US cents per kWh extra.
Government Monopolies					
Tayning and Tan-Chau	20.00	20.00	20.00	20.00	Off-peak low tension power flat rate, ONDEE tax of 0.14 US cent per kWh extra.
Cocong	16.45	16.45	16.45	16.45	
Caolanh	28.60	28.60	28.60	28.60	
Western Samoa	4.63	4.63	4.63	4.63	Discount US¢ 1.14 per kWh for prompt payment.

[a] No separate domestic power tariff for Cambodia and the Central Electricity Board of the former Federaton of Malaya.
No data available for Iran and Mongolia.

Table 18 A. *(Cont'd)*

(c) *Commercial consumers*[a]

Countries and undertakings	Average rate in US cents per kWh for a monthly consumption of 100 kWh	250 kWh	500 kWh	1000 kWh	Remarks
Afghanistan					
Kabul	2.27	2.27	2.27	2.27	
Kandahar	6.01	6.01	6.01	6.01	
Mazar-i-Shariff	9.05	9.05	9.05	9.05	
Australia					
Brisbane City Council	8.62	8.62	7.15	6.5	
Sydney City Council	6.66	5.99	5.18	4.77	Tariffs based on quarterly consumption.
State Electricity Commission of Victoria	7.25	7.04	6.96	6.94	Lighting, heating and power.
Brunei	8.17	8.17	8.17	8.17	
Burma					
Rangoon Electric Supply	9.45	9.10	8.80	8.43	Same as the general purpose tariff. For large commercial consumers with demand over 50 kW — First 2000 kWh — 18 ¢ Next 2000 kWh — 7.15 ¢ Next 6000 kWh — 4.2 ¢ All excess — 2.73 ¢
Cambodia					
Phnom-Penh	9.75	9.75	9.75	9.75	General rate for lighting consumers.
	9.14	9.14	9.14	9.14	For government and public buildings.
Battambang	20.7	20.7	20.7	20.7	General rate for lighting consumers.
	20.6	20.6	20.6	20.6	For government and public buildings.
Kandal	10.0	10.0	10.0	10.0	General rate for lighting consumers.
	9.40	9.40	9.40	9.40	For government and public buildings.
Provincial	20.5	20.5	20.5	20.5	General rate for lighting consumers.
	18.5	18.5	18.5	18.5	For government and public buildings.
Ceylon					General purpose tariff applicable to shops, hotels, etc., for demand not exceeding 25 kVA.
	8.40	6.80	4.87	3.70	For maximum demand 0 — 5 kVA
	8.40	8.40	7.23	4.87	„ „ „ 5 — 10 „
	8.40	8.40	8.40	6.05	„ „ „ 10 — 15 „
	8.40	8.40	8.40	7.23	„ „ „ 15 — 20 „
	8.40	8.40	8.40	8.40	„ „ „ 20 — 25 „
China (Taiwan)					
Taiwan Power Company	4.25	4.25	4.25	4.25	Lighting only.
	3.57	2.23	1.78	1.55	Combined lighting and power — M.D. 3 kW (two part tariff). For M.D. of 15 kW (L.T.) and consumption of 5,000 kWh — 1.86 US cents. For M.D. of 100 kW (at H.T.) and consumption of 50,000 kWh 1.20 US cents.
Hong Kong					
Hong Kong Electric Co. Ltd.	4.90	4.81	4.73	4.61	Lighting rate } Subject to 9% fuel surcharge.
	2.10	2.10	2.10	2.10	Power rate. } Subject to 9% fuel surcharge.
China Light & Power Co. Ltd., Kowloon	5.08	5.08	5.08	5.08	Lighting rate } Subject to 9% fuel surcharge.
	2.45	2.45	2.45	2.45	Power rate. } Subject to 9% fuel surcharge.
India					
Madras State Electricity Board	6.10	5.84	5.75	5.50	Combined lighting and fans rate.
Kerala State Electricity Board	6.30	5.05	4.62	4.41	For cinematograph installations only (no separate commercial rate).
Mysore State Electricity Board	5.46	5.46	5.46	5.15	
Bombay State Eelectricity Board	26.20*	10.48*	5.24	5.24	*Based on monthly minimum charge. Combined lighting and power rate for cinemas, theatres, etc.
Delhi Electric Supply Undertaking	3.78	3.78	3.78	3.78	Lights and fans } Applicable to commercial establishments, hotels, clubs etc; 5% rebate allowed for prompt payment
	2.10	2.10	2.10	2.10	For other purposes } Applicable to commercial establishments, hotels, clubs etc; 5% rebate allowed for prompt payment
Punjab State Electricity Board	3.67	2.65	2.31	2.13	Combined lighting and power rate for demands up to 10 kW.
Orissa, Hirakud project area	4.37	4.15	4.07	4.03	Combnied lighting and power rate for demand up to 10 kW.

Table 18 A. *(Cont'd)*

(c) *Commercial consumers*[a]

Countries and undertakings	*Average rate in US cents per kWh for a monthly consumption of* 100 kWh	250 kWh	500 kWh	1000 kWh	*Remarks*
Indonesia					
Java	An average over-all rate of 3.41 US cents is reported.				No detailed information available.
Other islands	An average over-all rate of 4.26 US cents is reported.				
Iran					
Isfahan-Turbine Co.	3.83	3.91	3.94	3.95	Single phase low voltage supply (Tax extra at 1.32 US¢ per kWh)
	2.64	2.64	2.64	2.64	Three phase low voltage supply for day time lighting and power.
	3.96	3.96	3.96	3.96	Three phase low voltage supply for night time lighting and power.
Khuzistan	3.30	3.30	3.04	2.84	General rates for demand below 40 kW; If demand exceeds 10 kW a minmum bill of US$1.32 plus US$1.32 for every kW demand exceeding 10 kW will be added. Texes extra at 5% of the bill.
Tehran	4.61	4.61	4.61	4.61	Night consumption; tax extra at 1.32 US¢ per kWh for consumption in excess of 50 kWh.
	1.98	1.98	1.98	1.98	Day consumption; tax extra as follows:— Up to 1,000 kWh monthly consumption 0.66 US¢ per kWh. Over 1,000 kWh monthly consumption 0.33 US¢ per kWh. Subscription fee extra as follows:— 13.2 US¢ for meter with maximum monthly consumption of 100 kWh, 66 US¢ for 500 kWh, US$1.06 for 800 kWh, US$1.32 for over 800 kWh.
Shiraz	6.60	6.60	6.60	6.60	Peak hour consumption, 6 p.m. to 11 p.m.
	3.30	3.30	2.64	2.64	Offpeak consumption.
Japan					
Hokkaido E.P. Co.	3.89	3.22	3.14	3.14	Based on the assumption that consumptions of 100 kWh and 250 kWh correspond to 20 amp. lighting contract and those of 500 kWh and 5 kW and 10 kW contract power respectively.
Tohoku " "	3.70	3.03	3.14	3.14	
Tokyo " "	3.83	3.22	3.56	3.56	
Chubu " "	3.83	3.20	2.99	2.99	
Hokuriku " "	3.58	2.99	2.92	2.92	
Kansai " "	3.11	3.08	3.25	3.25	
Chugoku " "	3.18	3.11	3.25	3.25	
Shikoku " "	3.44	3.22	3.28	3.28	
Hyushu " "	3.98	3.39	4.05	4.05	
Laos					
Luangprabang	18.25	18.25	18.25	18.25	Lighting and fans flat rate for different cities.
Vientiane	17.00	17.00	17.00	17.00	
Thakhek	18.75	18.75	18.75	18.75	
Savannakhet and Pakse	18.10	18.10	18.10	18.10	
Luangprabang	13.25	13.25	13.25	13.25	Motive power flat rates for different cities.
Vientiane	13.60	13.60	13.60	13.60	
Savannakhet	14.78	14.78	14.78	14.78	
Pakse	14.55	14.55	14.55	14.55	
Malaysia:					
Former Federation of Malaya					
Central Electricity Board					
Central network	8.83	8.83	8.83	8.83	General rates for lighting, fans and other purposes when metered together.
Johore Bahru	8.16	7.19	6.87	6.70	
Province Wellesley, Parit Buntar and Bandar Bahru.					
Ipoh, Batu Gajah, Tanjang Rambutan	9.80	9.80	9.80	9.80	

Table 18 A. *(Cont'd)*

(c) *Commercial consumers*[a]

Countries and undertakings	*Average rate in US cents per kWh for a monthly consumption of* 100 kWh	250 kWh	500 kWh	1000 kWh	*Remarks*
Central network	2.62	2.62	2.62	2.62	General power rates other than for lighting and fans when metered separatly.
Ipoh etc.	2.53	2.53	2.53	2.53	
Province Wellesley etc.	3.10	3.10	3.10	3.10	
Cameron Highlands . . .	2.37	2.37	2.37	2.37	
Other places	3.27	3.27	3.27	3.11	
Penang Municipality	8.65	8.65	8.65	7.76	Lighting purposes.
	2.62	2.62	2.62	2.62	Power purposes only.
Kinta Electrical Distribution Co. Ltd.	10.13	10.13	10.13	10.13	Lighting — Applicable to supply from diesel stations.
	3.27	3.27	3.27	3.11	Power only
	8.50	7.51	7.19	7.02	Lighting — Applicable to supply from steam and hydro stations and redistribution of purchased power.
	2.62	2.62	2.62	2.62	Power only
The Perak River Hydro-electric Power Co. Ltd.	8.50	7.50	7.20	7.03	Lighting rate — Same as domestic lighting and power rates.
	2.62	2.62	2.62	2.62	Power rate
Huttenbach Ltd.	10.12	10.12	10.12	10.12	Lighting purposes only for Alor Star, Sungei Patani etc.; flat rates per kWh of US¢ 9.48 and US¢ 9.80 applicable in other towns.
	3.27	3.27	3.27	3.19	Power purposes only.
North Borneo (Sabah)	6.53	6.53	6.53	6.53	Commercial power and heating rate. This flat rate is reduced to US¢ 3.92 per kWh for offpeak periods.
	3.27	3.27	3.27	3.27	Lighting and power combined for hotels, cinemas, etc. taking supply from undertakings with installed capacity over 1,000 kW; an additional fixed charge of US¢ 57.1 per 100 sq ft of floor area is also payable.
	8.16	5.13	4.25	3.76	Shops, houses and residential quarters, on one meter, taking supply from undertakings with installed capcaity over 1,000 kW.
Sarawak					
Kuching and Sibu	4.90	4.90	4.90	4.90	Business power rates (no lighting included).
Miri and other places	5.55	5.55	5.55	5.55	
10th mile	9.80	9.80	9.80	9.80	
Kuching and Sibu	9.80	9.80	9.80	9.80	Combined lighting and power rates for cinemas and theatres.
Miri and other places	11.45	11.45	11.45	11.45	
10th mile	19.60	19.60	19.60	19.60	
Singapore	6.54	6.54	6.54	6.54	For consumption including lighting and power for hotels, cinemas and amusement parks.
New Zealand					
Wellington City Corporation	3.48	3.48	3.48	3.01	Meters read and bills rendered once in two months.
Auckland Electric Power Board	4.64	4.2	3.8	2.965	
Pakistan					
East Pakistan WAPDA Narayanganj	6.57	6.57	6.57	6.57	Commercial power flat rate; rebate for prompt payment 1.31 US cents per kWh.
West Pakistan WAPDA . . .	4.60	4.60	4.60	4.60	Flat rate for all commercial purposes in hotels, commercial offices etc.
Karachi	4.30	4.48	4.54	4.57	Commercial lighting rate (not applicable to hotels).
	5.90	5.90	5.90	5.90	Flat rate applicable only to hotels.
Philippines					
Manila Electric Company . .	3.20	2.56	1.92	1.60	Genearl service rate for lighting and power; connected load up to 5 kW.

Table 18 A. *(Cont'd)*

(c) *Commercial consumers*[a]

Countries and undertakings	Average rate in US cents per kWh for a monthly consumption of 100 kWh	250 kWh	500 kWh	1000 kWh	Remarks
Thailand					
Metropolitan Electricity Authority	4.50	4.14	3.78	3.47	For Bangkok and Thonburi only; the first rate is applicable to establisments which are partly commercial and partly residential. The second rate is applicable to business establishments and small industries demanding less than 30 kW.
	4.67	4.29	3.89	3.51	
Viet-Nam, Republic of					
S.I.P.E.A.					
Hong Ha, Quang-Tr, Hue, Nha-Trong, Thap-Cham, Da-Nang and Hoi-An	17.60	17.60	17.60	17.60	Lighting and fans flat rate for administrative buildings and residential part of public companies.
Dalat (concession)	8.00	8.00	8.00	8.00	Flat lighting rate for administrative building.
C.E.E.					
Saigon-Cholon and three northern provinces	6.85	6.85	6.85	6.85	Flat power rate for administrative buildings, ONDEE tax of 0.57 US cents per kWh extra.
S.C.E.E.					
Cantho, Phuvinh, Long Xuyen Sadec, Khanh Hung	15.10	15.10	15.10	15.10	Flat lighting rate for administrative buildings, ONDEE tax of 0.57 US cents per kWh extra.
	13.15	13.15	13.15	13.15	Low tension power flat rate for administrative buildings, ONDEE tax of 0.14 US¢ per kWh extra.
Vinh-Long	20.60	20.60	20.60	20.60	Flat lighting rate for administrative buildings, ONDEE tax of 0.57 US cents, per kWh extra.
	17.80	17.80	17.80	17.80	Low tension power flat rate for administrative buildings, ONDEE tax of 0.14 US cents per kWh extra.
U.N.E.D.I.					
Bentre, Baria Vang Tau Phanthiet	17.15	17.15	17.15	17.15	Flat lighting rate for administrative buildings, ONDEE tax of 0.57 US cents, per kWh extra.
	17.00	17.00	17.00	17.00	Low tension power flat rate for administrative buildings, ONDEE tax of 0.14 US cents per kWh extra.
My-Tho	22.65	22.65	22.65	22.65	Flat lighting rate for administrative buildings, ONDEE tax of 0.57 US cents, per kWh extra.
	19.55	19.55	19.55	19.55	Low tension power flat rate for administrative buildings, ONDEE tax of 0.14 US cents per kWh extra.
S.A.E.R.					
Rach-Gia	16.45	16.45	16.45	16.45	Flat lighting rate for administrative buildings, ONDEE tax of 0.57 US cents, per kWh extra.
	14.60	14.60	14.60	14.60	Low tension power flat rate for administrative buildings, ONDEE tax of 0.14 US cents per kWh extra.
Government Monopolies					
Tayning and Tan-Chau	20.00	20.00	20.00	20.00	Flat lighting rate for administrative buildings, ONDEE tax of 0.57 US cents per kWh extra.
Cocong	16.45	16.45	16.45	16.45	
Caolanh	28.60	28.60	28.60	28.60	
Western Samoa	4.63	4.63	4.63	4.63	Discount 1.14 US cents per kWh for prompt payment.

[a] No data available for Iran and Mongolia.

No special commercial tariff for the Republic of Korea, Nepal and Pakistan.

Table 18 A. *(Cont'd)*

(*d*) *Industrial consumers*[a]

Countries and undertakings	*Average rate in US cents per kWh for consumption at different load factors* 10%	25%	50%	60%	75%	100%	*Remarks*
Afghanistan	2.27	2.27	2.27	2.27	2.27	2.27	Flat energy rate.
Australia							
Brisbane City Council	4.74	2.585	1.88	1.76	1.64	1.525	Two-part all-in rate (250 kW demand).
	3.27	2.26	1.925	1.87	1.81	1.763	One-part rate, no lighting — 250 kW demand.
	2.155	1.80	1.695	1.67	1.66	1.64	One-part rate, no lighting — 800 kW demand.
Sydney Council	3.56	3.12	2.90	2.86	2.805	2.79	Demand 250 kW, single part tariff based on quarterly consumption.
	7.78	3.57	2.16	1.93	1.70	1.465	H.T. supply, M.D. 800 kW, p.f. 0.8 two-part tariff.
State Electricity Commission of Victoria	2.81	2.38	2.21	2.19	2.16	2.12	One-part all-in rate calculated for demand of 250 kW.
	5.46	2.70	1.785	1.635	1.48	1.325	Two-part rate H.T. supply, M.D. 800 kW.
Brunei	2.62	2.62	2.62	2.62	2.62	2.62	Flat energy rate.
Burma							
Rangoon Electric Supply . . .	3.70	2.79	2.45	2.39	2.33	2.28	800 kW M.D. at 0.8 p.f.
	3.88	3.10	2.64	2.55	2.46	2.37	250 kW M.D. at 0.8 p.f.
Cambodia							
Phnom-Penh	7.35	6.90	6.77	6.74	6.72	6.69	Low tension two-part tariff (flat energy rate tariffs as well as off-peak rates are also offered).
	6.02	5.65	5.52	5.50	5.48	5.46	High tension two-part tariff.
	6.45	6.45	6.45	6.45	6.45	6.45	Flat rate for sewage and water works pumping (L.T.).
Battambang	Flat rate from 15.5 to 15.4 cents						Low tension rates.
	14.5	14.5	14.5	14.5	14.5	14.5	High tension rates.
Kandal	7.43	6.94	6.78	6.76	6.74	6.72	Low tension two-part tariff (flat energy rate tariffs as well as off-peak rates are also offered).
	6.04	5.67	5.55	5.53	5.50	5.48	High tension two-part tariff.
	6.92	6.92	6.92	6.92	6.92	6.92	Flat rate for sewage and water works pumping (L.T.).
Provincial	16.11	15.54	15.36	15.30	15.25	15.20	Low tension two-part tariff (flat energy rate tariff as well as off-peak rates are also offered).
	12.65	12.15	11.98	11.96	11.93	11.90	High tension two-part tariff for public purposes.
	13.92	13.45	13.30	13.26	13.23	13.20	High tension two-part tariff for private purposes.
Ceylon							Two-part tariff for supply at 400 volts or less and demand exceeding 25 kVA.
	4.08	2.52	1.99	1.91	1.81	1.67	250 kW demand at 0.8 p.f.
	3.95	2.47	1.97	1.88	1.79	1.66	800 kW demand at 0.8 p.f.
							For supply at over 400 volts and demand exceeding 25 kVA.
	3.75	2.26	1.76	1.68	1.58	1.48	250 kW demand at 0.8 p.f.
	3.58	2.19	1.72	1.65	1.56	1.46	800 kW demand at 0.8 p.f.
China (Taiwan)							High tension two-part tariff rate:
	1.97	1.19	0.91	0.86	0.81	0.77	For M.D. 800 kW at 0.8 p.f.
	2.00	1.22	0.96	0.91	0.85	0.78	For M.D. 250 kW at 0.8 p.f.
	1.86	1.18	0.94	0.90	0.86	0.82	L.T. two-part tariff for an M.D. of 100 kW at 0.8 p.f.
Hong Kong							
The Hong Kong Electric Co. Ltd.	2.01	2.01	2.00	2.00	2.00	2.00	For a demand of 200 kW } All rates subject to adjustment for variation of fuel cost which is + 9% at present.
	2.01	2.01	2.00	2.00	2.00	2.00	For a demand of 100 kW } All rates subject to adjustment for variation of fuel cost which is + 9% at present.
							Rates for demands exceeding 200 kW subject to special negotiation.
China Light & Power Co. Ltd.	2.45	2.45	2.45	2.45	2.45	2.45	Subject to 9% fuel surcharge.

Table 18 A. *(Cont'd)*

(*d*) *Industrial consumers*[a]

Countries and undertakings	Average rate in US cents per kWh for consumption at different load factors: 10%	25%	50%	60%	75%	100%	Remarks
India							
Damodar Valley Corporation	3.03	1.55	1.06	0.98	0.90	0.82	5,000 kVA, 0.8 p.f., 33 kV
	2.82	1.47	1.02	0.94	0.87	0.79	25,000 kVA, 0.8 p.f., 33 kV.
Madras State Electricity Board	3.17	1.80	1.29	1.19	1.09	0.98	800 kW, 0.8 p.f., 5,11 or 22 kV.
	3.17	1.86	1.43	1.34	1.23	1.12	250 kW, 0.8 p.f., 5,11 or 22 kV.
	2.01	1.95	1.92	1.915	1.91	1.91	L.T. supply, 50 kW demand } No lighting included
	2.1	2.1	2.01	1.99	1.97	1.96	L.T. supply, 10 kW demand } No lighting included
Kerala State Electricity Board	1.47	1.47	1.13	1.06	0.97	0.89	800 kW at 11 kV.
	1.47	1.47	1.27	1.19	1.11	1.03	250 kW at 11 kV.
	2.62	1.74	1.45	1.40	1.35	1.30	L.T. supply — demand of 50 kW.
Mysore State Electricity Board	2.45	1.65	1.06	0.94	0.82	0.69	800 kW, 0.8 p.f. at 2.2 kV and over.
	2.49	1.73	1.09	0.97	0.84	0.71	250 kW, 0.8 p.f. at 2.2 kV and over.
	3.82	2.15	1.50	1.39	1.26	1.17	L.T. supply — demand of 50 kW.
Madhya Pradesh Electricity Board (Southern Grid) . . .	3.28	1.98	1.53	1.45	1.37	1.28	800 kW at 11 kV.
	3.34	2.02	1.57	1.50	1.42	1.34	250 kW at 11 kV.
	2.63	2.48	2.34	2.28	2.21	2.16	L.T. supply, connected load 100 HP, and a maximum demand of 50 kW.
Bombay State Electricity Board	4.05	2.22	1.53	1.42	1.30	1.15	800 kW demand high voltage supply.
	4.50	2.39	1.69	1.56	1.41	1.28	280 kW demand high voltage supply.
	4.68	3.28	2.36	2.19	2.02	1.84	L.T. supply 50 kW demand.
Delhi Electric Supply Undertaking	2.22	2.05	1.60	1.53	1.45	1.36	800 kW } Subject to adjustment for variation of price of fuel.
	3.78	2.21	1.68	1.59	1.51	1.42	250 kW } Subject to adjustment for variation of price of fuel.
Tata Hydro-electric Agencies Ltd.	2.69	1.49	1.08	1.01	0.94	0.85	Maximum demand 1,000 kVA, at 10/22/11/6.6/3.3 kV.
Punjab State Electricity Board	1.18*	1.18*	1.18	1.11	0.99	0.88	800 kW at 3.3/6.6/11 kV.
	1.18*	1.18*	1.18*	1.15	1.05	0.93	250 kW at 3.3/6.6/11 kV. *Subject to the over-all maximum charge of 0.9 anna per kWh.
Orissa, Hirakud project area .	1.99*	1.89*	1.89*	1.89*	1.89*	1.88	*Subject to an over-all maximum charge of 9 np per kWh.
Indonesia							
Java	An average over-all rate of 2.56 US cents is reported						A multi-part tariff in which demand and energy charges are made; detailed information is not available.
Other islands	An average over-all rate of 3.20 US cents is reported						A multi-part tariff in which demand and energy charges are made; detailed information is not available.
Iran							
Isfahan	2.31	2.16	1.90	1.84	1.77	1.71	250 kW demand, 6 kV supply for factories.
Khuzistan	3.61	2.00	1.45	1.37	1.28	1.20	800 kW demand } tax extra at 5% of the total bill.
	3.76	2.10	1.51	1.41	1.32	1.22	250 kW demand } tax extra at 5% of the total bill.
Tehran	1.55	1.53	1.53	1.52	1.52	1.52	250 kW demand, high voltage supply; tax extra at 0.33 US¢ per kWh for all monthly consumption in excess of 2,500 kWh; subscription fee extra at US$1.32 for every meter having a maximum monthly consumption exceeding 800 kWh.
Japan*							
Hokkaido E.P. Co.	—	1.60	1.39	1.30	1.29	1.25	1,000 kW demand 0.85 p.f.
Tohoku E.P. Co.	—	1.54	1.11	1.05	0.96	1.03	1,000 kW demand 0.85 p.f.
Chubu E.P. Co.	—	1.12	0.94	0.91	1.09	1.06	1,000 kW demand 0.85 p.f.
Hokuriku E.P. Co.	—	1.33	1.16	1.11	1.04	1.00	1,000 kW demand 0.85 p.f.
Kansai E.P. Co.	—	1.18	0.98	0.94	1.11	1.07	1,000 kW demand 0.85 p.f.
Chugoku E.P. Co.	—	1.47	1.25	1.19	1.30	1.30	1,000 kW demand 0.85 p.f.
Shikoku E.P. Co.	—	1.48	1.26	1.20	1.27	1.22	1,000 kW demand 0.85 p.f.
Kyushu E.P. Co.	—	1.98	1.60	1.50	1.32	1.27	1,000 kW demand 0.85 p.f.
Hokkaido E.P. Co.	—	1.67	1.47	1.41	1.22	1.04	250 kW demand 0.85 p.f.
Tohoku E.P. Co.	—	1.42	1.22	1.15	1.00	0.86	250 kW demand 0.85 p.f.
Tokyo E.P. Co.	—	1.49	1.23	1.20	1.00	0.90	250 kW demand 0.85 p.f.
Chubu E.P. Co.	—	1.42	1.25	1.17	1.03	0.88	250 kW demand 0.85 p.f.
Hokuriku E.P. Co.	—	1.35	1.18	1.05	0.97	0.83	250 kW demand 0.85 p.f.
Kansai E.P. Co.	—	1.45	1.25	1.17	1.02	0.88	250 kW demand 0.85 p.f.
Chugoku E.P.	—	1.71	1.50	1.41	1.24	1.06	250 kW demand 0.85 p.f.
Shikoku E.P. Co.	—	1.74	1.52	1.44	1.26	1.08	250 kW demand 0.85 p.f.
Kyushu E.P. Co.	—	2.05	1.78	1.67	1.46	125	250 kW demand 0.85 p.f.

* Figures under load factor columns 25% and 75% refer actually to 30% and 80%.

Table 18 A. *(Cont'd)*

(d) Industrial consumers[a]

Countries and undertakings	Average rate in US cents per kWh for consumption at different load factors 10%	25%	50%	60%	75%	100%	Remarks
Korea, Republic of							
	1.14	1.05	1.03	1.02	1.02	1.01	Special power rate based on 800 kW demand at 0.8 power factor.
	1.34	1.34	1.30	1.30	1.29	1.28	General power rate based on 250 kW demand at 0.8 power factor.
Laos							
Luangprabang	9.68	9.68	9.68	9.68	9.68	9.68	Off-peak power rates.
Vientiane	8.50	8.50	8.50	8.50	8.50	8.50	— do —
	9.25	9.25	9.25	9.25	9.25	9.25	— do —
Malaysia:							
Former Federation of Malaya							
Central Electricity Board							
Central network	3.20	2.78	2.35	2.23	2.14	2.01	Variable block industrial tariff for minimum consumption of 10,000 kWh per month, p.f. not less than 0.8.
Johore Bahru	3.17	2.77	2.37	2.28	2.15	2.03	
Province Wellesley, Taiping and other places	2.45	2.45	2.45	2.45	2.45	2.45	Diesel station off-peak flat rate.
Province Wellseley	2.62	2.62	2.62	2.62	2.62	2.62	All-purpose flat rate for minimum consumption of 10,000 kWh per month.
Penang Municipality	5.76	3.04	2.13	1.98	1.83	1.68	Industrial two-part tariff based on a flat demand charge of M$10.00 per kW and a flat energy charge of 3.75 M¢ per kWh. Rates subject to adjustment for variation of fuel oil price.
Kinta Electrical Distribution Co Ltd.	2.99	2.88	2.83	2.83	2.81	2.80	Tariff applicable to supply from diesel stations only (for an assumed M.D. of 50 kW).
	2.47	2.36	2.32	2.32	2.31	2.30	Tariff applicable to supply from steam and hydro-electric stations and for redistribution of purchased power (assumed M.D. of 50 kW).
Perak River Hydro-electric Power Co., Ltd.	1.31	1.26	1.23	1.21	1.19	1.17	Average rate for a demand of 800 kW. Mining load only
	1.32	1.32	1.28	1.27	1.26	1.25	Average rate for a demand of 250 kW. Mining load only
	2.32	2.30	2.29	2.29	2.29	2.29	Average rate for a demand of 250 kW — other miscellaneous industries.
Huttenbachs Ltd.	3.13	2.90	2.76	2.73	2.71	2.68	Average rate for a maximum demand of 50 kW.
North Borneo (Sabah)	3.27	2.88	2.75	2.72	2.70	2.68	Industrial power based on 250 kW demand at 0.8 power factor.
Sarawak							
Sarawak Electricity Supply Co., Ltd:							
Kuching and Sibu . . .	3.01	2.78	2.69	2.68	2.67	2.66	200 kW demand L.T. supply; off-peak rates subject to special negotiation.
Miri and other places . .	4.25	4.05	3.99	3.98	3.96	3.95	
10th mile	6.87	6.68	6.61	6.59	6.58	6.57	
Singapore							
Electricity Department . . .	1.75	1.61	1.50	1.47	1.46	1.44	Tariff rate based on a straight energy charge only. Figures worked for a 200 kW demand.
Nepal	1.56	1.41	1.36	1.35	1.34	1.34	Industrial two-part tariff; (fixed charge of Rs1/- per HP and an energy charge of 10 pice per kWh).
New Zealand							
Wellington City Corporation .	1.85	1.575	1.48	1.465	1.45	1.435	250 kW M.D. Meters read once in two months.
	1.53	1.45	1.418	1.413	1.410	1.405	800 kW M.D.
Auckland Electric Power Board	5.00	1.95	1.305	1.295	1.18	1.115	250 kW M.D. This rate has a minimum demand charge and introduces certain conditions such as demand during 'peak hour'.
	4.795	1.92	1.305	1.295	1.18	1.115	800 kW M.D.
Pakistan							
East Pakistan WAPDA . . .	3.28	3.28	3.28	3.28	3.28	3.28	Industrial power off-peak low tension flat rate.
	4.27	4.27	4.27	4.27	4.27	4.27	Unrestricted supply L.T. power flat rate.
	2.21	2.07	2.02	2.01	2.00	1.99	800 kW M.D. All-purpose high tension rate in sliding scale and subject to coal clause adjustment.
	2.74	2.28	2.12	2.10	2.07	2.05	250 kW M.D.
Chittagong, Khulna and suburbs of Dacca, Goalpara and Narayanganj	1.85	1.62	1.55	1.54	1.52	1.51	Industrial two-part tariff; (fixed charge of Rs 13 per kW and an energy charge of 1.12 annas per kWh) adjustment according to fuel variation clause applicable.

Table 18 A. *(Cont'd)*

(*d*) *Industrial consumers*[a]

Countries and undertakings	Average rate in US cents per kWh for consumption at different load factors 10%	25%	50%	60%	75%	100%	Remarks
West Pakistan WAPDA . . .	4.77	2.76	2.09	1.98	1.87	1.76	800 kW M.D. } Industrial two-part tariff at 3.3 kV, 6.6 kV and 11 kV supply.
	4.97	2.87	2.18	2.06	1.94	1.83	250 kW M.D. }
	5.13	2.95	2.23	2.10	1.99	1.87	800 kW M.D. } Industrial two-part tariff at 400/230 Volts supply.
	5.35	3.07	2.31	2.19	2.07	1.94	250 kW M.D. }
Karachi	1.73	1.52	1.27	1.23	1.19	1.15	800 kW M.D. } Industrial two-part tariff for power service not less than 50 kW at 11 kV supply.
	1.96	1.60	1.29	1.26	1.22	1.17	
Philippines							
Manila Electric Co.	2.15	1.35	0.98	0.91	0.85	0.78	800 kW, 0.85 p.f. at voltages as available and appropriate.
	2.15	1.39	1.02	0.95	0.88	0.80	250 kW, 0.85 p.f. at voltages as available and appropriate.
	2.18	1.08	0.72	0.67	0.61	0.54	Wholesale power rate at 2.3 kV to 34.5 kV for demands of 1,000 kW and above.
National Power Co.:							
Agusan	2.87	1.59	1.04	0.93	0.80	0.69	Bulk supply tariffs of NPC plants to licensees; rates are the same for all power demands up to 1,000 kW.*
Caliraya, Ambuklao, Binga .	2.05	0.98	0.63	0.56	0.51	0.45	
Maria Cristina	2.26	0.98	0.55	0.48	0.41	0.29	
Tolomo	2.24	1.39	1.10	1.05	1.01	0.96	Bulk supply based on 250 kW demand.* *Effective up to October 1962; revised rates applied from 1 November 1962 onwards.
Thailand							
Metropolitan Electricity Authority	5.09	3.33	2.55	2.38	2.13	1.88	800 kW demand } Industrial two-part tariff for maximum demand exceeding 30 kW.
	5.46	3.45	2.62	2.43	2.17	1.92	250 kW demand }
Viet-Nam, Republic of							
S.I.P.E.A.							
Hong Ha, Quang-Tri, Nha-Trang, Thap-Cham, Da-Nang and Hoi-An	14.95	14.95	14.95	14.95	14.95	14.95	Low tension power flat rate for municipal pumping.
	13.30	13.30	13.30	13.30	13.30	13.30	Off-peak high tension power flat rate.
Dalat (concession)	6.75	6.75	6.75	6.75	6.75	6.75	Low tension power flat rate.
Banmethout and Pleiku (Monopoly)	11.42	11.42	11.42	11.42	11.42	11.42	Flat power rate.
C.E.E.							
Saigon-Cholon and three northern provinces	6.55	6.55	6.55	6.55	6.55	6.55	Low tension power flat rate, ONDEE tax of 0.14 US cents per kWh extra.
	6.04	6.04	6.04	6.04	6.04	6.04	High tension power flat rate.
	5.51	5.51	5.51	5.51	5.51	5.51	Flat power rate for water pumping.
S.C.E.E.							
Cantho, Phuvinh Long Xuyen, Sadec Khanh Hung . . .	12.00	12.00	12.00	12.00	12.00	12.00	High tension power flat rate and power rate for pumping.
Vinh-Long	15.20	15.20	15.20	15.20	15.20	15.20	
U.N.E.D.I.							
Bentre, Baria, Vung Tau, Phanthiet	17.00	17.00	17.00	17.00	17.00	17.00	High tension power flat rate.
	15.15	15.15	15.15	15.15	15.15	15.15	Flat power rate for pumping.
My-Tho	16.55	16.55	16.55	16.55	16.55	16.55	High tension power flat rate and power rate for pumping.
Government monopolies							
Tayninh and Tan-Chau Gocong	20.00	20.00	20.00	20.00	20.00	20.00	— do —
	16.45	16.45	16.45	16.45	16.45	16.45	— do —
Caolanh	28.60	28.60	28.60	28.60	28.60	28.60	— do —
Western Samoa	4.63 US cents for the first 3,000 kWh per month; all units in excess 3.48 US cents.						Discount 1.16 US cents per kWh for prompt payment.

[a] No data available for Iran and Mongolia.

Table 18: Comparative Electricity Tariff Rates

B. Countries outside ECAFE region

(a) *Domestic lighting consumers*

Countries and undertakings	*Average rate in US cents per kWh for a monthly consumption of* 10 kWh	30 kWh	50 kWh	100 kWh	*Remarks*
United Kingdom					(Exchange rate 1 US$=7.15 s.).
London area	7.59	7.59	7.59	7.59	Alternative domestic tariff flat lighting rate.
South-eastern area	8.16	8.16	8.16	8.16	
Eastern area	7.59	7.59	7.59	7.59	Alternative domestic tariff fixed block lighting rate.
North-eastern area	6.12	6.12	6.12	6.12	Separate domestic tariff flat lighting rate.
United States of America					
Tennessee Valley Corporation					
Bristol, Cleveland, Tennessee and other places	3.0	3.0	3.0	2.5	A residential tariff — basic level; the rate changes as follows: First 50 kWh 3 cents per kWh Next 150 kWh 2.0 „ „ Next 200 kWh 1.0 „ „ Next 1000 kWh 0.4 „ „ Additional kWh at 0.75 „
Huntsville, Alabama, Dickson, Tennessee and other places . .	2.5	2.5	2.5	2.5	A residential tariff — below the basic level; the rate changes as follows: First 75 kWh at 2.5 cents per kWh Next 100 kWh at 1.5 „ „ Next 225 kWh at 1.0 „ „ Next 750 kWh at 0.4 „ „ Additional kWh at 0.75 „ „
Florence, Guntersville, Alabama and other places	2.0	2.0	2.0	2.0	A residential tariff — below the basic level; the rate changes as follows: First 100 kWh at 2 cents per kWh Next 250 kWh at 1 „ „ Next 700 kWh at 0.4 „ „ Additional kWh at 0.7 „ „

(b) *Domestic power consumers*

Countries and undertakings	*Average rate in US cents per kWh for a monthly consumption of* 100 kWh	250 kWh	500 kWh	1000 kWh	*Remarks*
United Kingdom					(Exchange rate 1 US$=7.15 s.).
London area	3.50	3.50	3.50	3.50	Alternative domestic tariff flat rate for purposes other than lighting.
South-eastern area	3.21	3.21	3.21	3.21	
United States of America					
Tennessee Valley Corporation					
Bristol, Cleveland, Tennessee and other places	2.50	2.00	1.38	0.89	A residential tariff — basic level; the rate changes as follows: First 50 kWh at 3 cents per kWh Next 150 kWh at 2 „ „ Next 200 kWh at 1 „ „ Next 1000 kWh at 0.4 „ „ Additional kWh at 0.75 „ „
Huntsville, Alabama, Dickson, Tennessee and other places	2.25	1.65	1.20	0.80	A residentail tariff — below basic level; the rate changes as follows: First 75 kWh at 2.5 cents per kWh Next 100 kWh at 1.5 „ „ Next 225 kWh at 1.0 „ „ Next 750 kWh at 0.4 „ „ Additional kWh at 0.75 „ „
Florence, Guntersville, Alabama, and other places	2.00	1.40	1.02	0.71	A residential tariff — below basic level; the rate changes as follows: First 100 kWh at 2 cents per kWh Next 250 kWh at 1 „ „ Next 700 kWh at 0.4 „ „ Additional kWh at 0.7 „ „

Table 18 B. *(Cont'd)*

(c) *Commercial consumers*

Countries and undertakings	Average rate in US cents per kWh for a monthly consumption of 100 kWh	250 kWh	500 kWh	1000 kWh	Remarks
United Kingdom					(Exchange rate 1 US$ = 7.15 s.).
London area	7.00	7.00	7.00	7.00	Flat rate for lighting only.
	2.92	2.92	2.92	2.92	Flat rate for purposes other than lighting.
	2.33	2.33	2.33	2.33	Flat rate for power when separately metered.
	1.75	1.75	1.75	1.75	Flat rate for cooking, thermal controlled water heating and commercial catering when separately metered.
South-eastern area	7.00	7.00	7.00	7.00	Flat rate for lighting only.
	2.63	2.63	2.63	2.63	Flat rate for purposes other than lighting.
South-western area	8.16	8.16	8.16	8.16	Flat rate for lighting in certain towns only.
	1.46	1.46	1.46	1.46	Flat rate for thermal controlled water heating.
	3.50	3.50	3.50	3.21	Fixed block rate for purposes other than lighting and water heating.
East Midlands area	7.29	7.29	7.29	7.29	Flat rate for lighting only.
	2.16	2.16	2.16	2.16	Flat rate for purposes other than lighting.
Merseyside and North Wales area	6.70	6.70	6.70	6.70	Flat rate for lighting only.
North-eastern area	5.83	5.83	5.83	5.83	Fixed block rate for lighting only.
	2.92	2.92	2.92	2.92	Fixed block rate for purposes other than lighting.
	1.75	1.75	1.75	1.75	Thermal controlled water heating rate.
	1.46	1.46	1.46	1.46	Fixed block rate for commercial catering.
North-western area	6.40	6.40	6.40	6.40	Flat rate for lighting only.
	2.61	2.59	2.31	2.17	Fixed block rate for purposes other than lighting.
	1.46	1.46	1.46	1.46	Flat rate for commercial catering.
United States of America					
Tennessee Valley Corporation					
Cleveland, Clinton, Tennessee and other places	3.00	2.60	2.30	1.65	Lighting and power tariff — basic level — for demand up to 10 kW.
Huntsville, Alabama, Dickson Tennessee and other places . .	2.50	2.30	1.90	1.47	Lighting and power tariff — below basic level — for demand up to 10 kW.
Florence, Guntersville, Alabama and other places	2.00	1.90	1.70	1.35	Lighting and power tariff — below basic level — for demand up to 10 kW.

Table 18 B. *(Cont'd)*

(*d*) *Industrial consumers*

Countries and undertakings	*Average rate in US cents per kWh for consumption at different load factors* 10%	25%	50%	60%	75%	100%	*Remarks*
United Kingdom							(Exchange rate 1 US$ = 7.15 s.). Standard industrial maximum demand monthly tariff (medium voltage delivery and metering).
Southern area	4.46	2.38	1.55	1.42	1.27	1.15	800 kW M.D. 0.8 p.f.
	4.66	2.45	1.58	1.45	1.29	1.14	250 kW M.D. 0.8 p.f.
South-western area							Period November to March
	4.32	2.35	1.68	1.57	1.47	1.35	800 kW M.D. 0.8 p.f.
	4.50	2.51	1.72	1.60	1.49	1.37	250 kW M.D. 0.8 p.f.
							Period April to October
	3.44	1.99	1.50	1.44	1.35	1.27	800 kW M.D. 0.8 p.f.
	3.61	2.06	1.54	1.46	1.37	1.28	250 kW M.D. 0.8 p.f. Service charge per month per kVA maximum power anticipated: From network US$14, from boards S/S US$10.5, from consumers S/S US$7.
							Period November to March
Eastern area	6.85	3.23	1.93	1.72	1.50	1.27	800 kW M.D. 0.8 p.f.
	7.36	3.44	2.03	1.80	1.56	1.32	250 kW M.D. 0.8 p.f.
							Period April to October
	2.38	1.45	1.04	0.97	0.90	0.82	800 kW M.D. 0.8 p.f.
	2.52	1.51	1.06	1.00	0.91	0.83	250 kW M.D. 0.8 p.f.
East Midlands area	4.49	2.26	1.50	1.36	1.23	1.08	Based on 0.8 p.f.; rates are the same for all power demands.
Midlands area	3.62	1.97	1.39	1.28	1.17	1.05	800 kW M.D. 0.8 p.f.
	3.74	2.02	1.41	1.31	1.19	1.07	250 kW M.D. 0.8 p.f.
South Wales area	4.43	2.28	1.53	1.39	1.25	1.10	800 kW M.D. 0.8 p.f.
	4.48	2.30	1.54	1.39	1.26	1.11	250 kW M.D. 0.8 p.f.
Merseyside and North Wales area	5.20	2.62	1.76	1.61	1.47	1.33	Period October to March
	3.90	2.10	1.50	1.40	1.30	1.20	Period April to September. Rates based on 0.8 p.f. and are the same for all demands from 5 kW upwards.
Yorkshire area	3.36	1.82	1.28	1.18	1.07	0.97	800 kW M.D. 0.8 p.f.
	3.49	1.86	1.30	1.19	1.09	0.98	250 kW M.D. 0.8 p.f.
North-eastern area	3.74	2.00	1.34	1.22	1.11	0.98	800 kW M.D. 0.8 p.f.
	3.82	1.98	1.35	1.24	1.12	0.99	250 kW M.D. 0.8 p.f. Service charge US$5.84 per month per kVA transformer capacity.
North-western area	3.94	2.05	1.38	1.25	1.13	1.00	800 kW M.D. 0.8 p.f.
	3.97	2.06	1.39	1.26	1.13	1.00	250 kW M.D. 0.8 p.f. Network service.
	3.70	1.95	1.33	1.21	1.10	0.98	800 kW M.D. 0.8 p.f.
	3.79	1.99	1.36	1.23	1.10	0.98	250 kW M.D. 0.8 p.f. Consumers substation.
United States of America							
Tennessee Valley Corporation							
	1.60	0.83	0.57	0.52	0.46	0.41	800 kW M.D.
	1.60	0.85	0.60	0.55	0.50	0.45	250 kW M.D. Wholesale rate
Bristol, Columbia, Tennessee and other places	1.98	1.00	0.65	0.59	0.53	0.47	800 kW M.D.
	2.16	1.20	0.80	0.73	0.64	0.55	250 kW M.D. Lighting and power tariff basic level; a fuel clause included.
Huntsville, Alabama, Dickson, Tennessee and other places	1.89	0.97	0.63	0.58	0.52	0.46	800 kW M.D.
	2.00	1.09	0.74	0.68	0.60	0.53	250 kW M.D. Lighting and power tariff below the basic level; a fuel clause included.
Florence, Guntersville, Alabama, and other places	1.83	0.94	0.62	0.57	0.52	0.46	800 kW M.D.
	1.87	1.01	0.71	0.65	0.58	0.51	250 kW M.D. Lighting and power tariff below the basic level; a fuel clause included.

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